TOPWORX

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CONTENTS

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In the process industries, there
is a single goal on everyone's mind:

improve process performance.

Improving performance means maximizing availability and minimizing variability, optimizing ROA and slashing CapEx, reducing waste and increasing productivity.

At TopWorx, we believe that networking is necessary to improve performance.

So our mission is to help process plants improve performance by using networking technologies.

This means adopting plant bus networks that use proven communication protocols to distribute information, interact with field devices, and diagnose potential problems. More than that, it means delivering real business results - like reduced capital, operating, and maintenance costs, improved product quality, and quicker time to market.

With that mission in mind, TopWorx has been busy lately.

We've been building a portfolio of networking and automation solutions that improve the performance of process plants. Superior services to help with bus network selection, design, and implementation, coupled with reliable products for field networking, valve control, and position sensing - all backed by industry-leading expertise and experience.

Networking is necessary.

Expertise is essential.

It's time for TopWorx.

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experience + expertise

The TopWorx Difference

In this downsized, “more output with less people” age, process plant personnel need help from suppliers, but not just any supplier will do.

Now more than ever, real experience and expertise count.

And no one knows more about networking in process plants than TopWorx. **No one.**

our experience

We know process plants
As our name suggests, we have an intense focus on the process industries. And after fifty years in business, we’ve developed a certain understanding of what works - and what doesn’t - in the demanding conditions of process plants.

Biotech
Chemical
Food & Beverage
Hydrocarbon
Oil & Gas
Petrochemical
Pharmaceutical
Power
Pulp & Paper
Water & Wastewater

our expertise

We know how to network
While other companies supply networking devices, TopWorx delivers complete networking solutions. In this age of understaffed process plants, that means all the difference in the world.

We know multiple busses
Unlike others, TopWorx has a depth of expertise in a variety of bus networks, not just the simple ones. And since most plants decide to implement multiple busses in a single location, our diversity of expertise is a real advantage for our customers.

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TopWorx serves the Process Industries

TopWorx is the leader in field networking, valve control, and position sensing solutions for the process industries.

Position Sensing Solutions

Using our unique GO Switch™ leverless limit switch technology, TopWorx delivers reliable position sensing solutions in the most demanding process environments. If your plant processes include conditions that are extremely hot, cold, wet, dirty, corrosive, abusive, or explosive, we have a reliable position sensor for you. Be sure to demand technology with an advantage - specify GO Switch leverless limit switches.

GO SWITCH

Valve Control Solutions

When it comes to process automation, we're all riding a new wave of bus networking technology. And when it comes to valve automation, no one is riding that wave better than TopWorx. Our ValveTop™ valve networking and control solutions support multiple bus protocols, operate in the most demanding of plant conditions, and carry a variety of global approvals. Whether your application is rotary or linear, bus or conventional, hazardous or general purpose, TopWorx has a suitable solution.

valvetop

Field Networking Solutions

With our experience in process plants and our expertise in bus networking, TopWorx has created Networx™: the most complete, cost-effective portfolio of field networking solutions available anywhere. Networx helps with bus network selection, design, and implementation, and takes charge of the critical layer between field devices and the process control system. Plus, it works with all of the major control systems commonly in use today.

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DeviceNet MODBUS PROFIBUS

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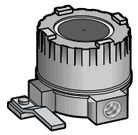
TopWorx Quick Selection Guide

Masters & Gateways



HazLink Connectivity

Cables, Connectors & Cordsets

Lumitech DVC/IVC
see pages 130, 140

Switchpak DXP/SXP DXS/SXS
pages 134, 148, 136, 150

Switchpak SRP
see page 152

I/O Modules & Access.

Power Supplies & Repeaters

Tools & Access.

Lumitech DVM/IVM
see pages 132, 142

Switchpak SSP
see page 146

Switchpak SUP
see page 154

Lumitech PPS
see page 144

Lumitech LPS
see page 166

GO Switch 31/35
see page 210

GO Switch 73/75
see page 216

GO Switch 7G/7L
see pages 218, 220

Switchpak SEP
see page 156

Switchpak SBP
see page 160

GO Switch 11/21
see page 206

GO Switch 81
see page 212

GO Switch 74
see page 216

Category

AREA CLASSIFICATION

- General Purpose
- Zone 0 Class I, Div 1 Intrinsically Safe
- Zone 1 Class I, Div 1 Explosion Proof
- Zone 2 Class I, Div 2 Non-Incendive

FIELDBUS NETWORK

- AS-i
- FOUNDATION
- DeviceNet
- PROFIBUS
- MODBUS
- GO SWITCH inside

Field Networking Solutions
Pages 15 – 117

Valve Control Solutions
Pages 119 – 193

Position Sensing Solutions
Pages 195 – 239

Products not shown to scale

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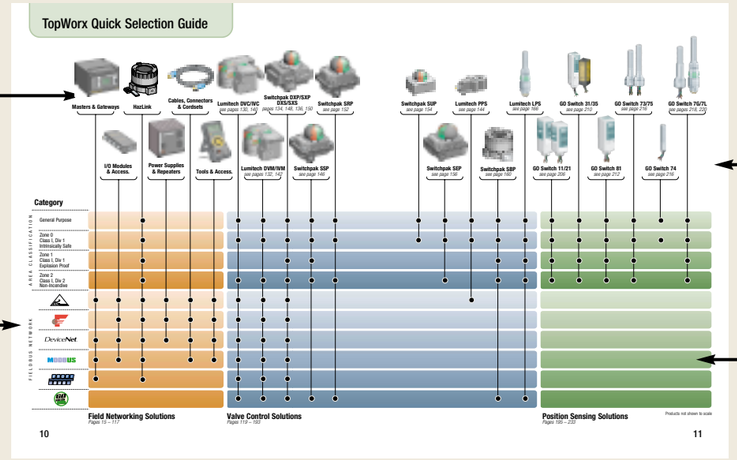
Ordering made simple.

Compare our full line of products to find the one that's best for you.

Select products by Area Classification or Fieldbus Network.



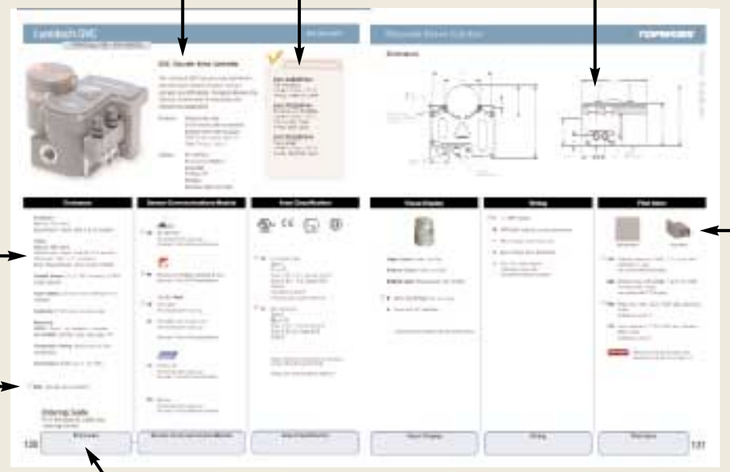
Page numbers make for fast access to info.

Convenient Chart Analysis.

Read a full description of the product and any special features it may include.

A complete list of our most popular 'Fast Track Delivery' models.

Convenient technical dimensions.



Detailed specifications are right where you need them.

Look for the checkmark. It denotes the most common options and the models most likely to be in stock.

Easy to view illustrations.

Custom build your product using our easy ordering guide! Choose your options, write the codes in the spaces provided, and simply give us a call to order!

FAST TRACK DELIVERY

TopWorx is committed to satisfying customer delivery requirements with speed and excellence. The products listed within the Fast Track Delivery program are standard products likely to be available for immediate shipment for normal size orders.

To Order
502.969.8000

Field Networking Products

NAS-GM13
AS-i to Modbus gateway, RS 485

NAS-GD01
AS-i to DeviceNet gateway

NAS-GP11
AS-i to Profibus DP gateway

NAS-1A03
AS-i heavy duty I/O module, 4I/4O

NAS-2A33
AS-i I/O module, 2I/2O

NAS-2B21
AS-i coupler module

NAS-5A01
AS-i 2.8A power supply unit

NAS-DT3
AS-i addressing & diagnostic tool

NFF-1A02
FOUNDATION 4-drop block with SCP

NFF-5A11
FOUNDATION I.S. repeater

NFF-DT3
FOUNDATION Fieldbus monitor

NFF-DT5
FOUNDATION Fieldbus wiring validator

NDN-DT8
DeviceNet handheld diagnostic tool

NSS-TT___
Bus network training courses

Valve Control Products

DVC-ASZ2BPS44
AS-Interface, Div 2, 4-way solenoid

DVM-ASZ2BP
AS-Interface, Div 2, Non-Incendive

DXP-ASZ1GR□S84
AS-Interface, Div 1, Explosion Proof

PPS-ASGPT1
AS-Interface, General Purpose

DVC-FFZ0BPP44
FOUNDATION, Zone 0, I.S., 4-way pilot

DVM-FFZ0BP
FOUNDATION, Zone 0, I.S.

DVC-DNZ2BPS44
DeviceNet, Div 2, 4-way solenoid

DVM-DNZ2BP
DeviceNet, Div 2, Non-Incendive

DXP-DNZ1GR□S84
DeviceNet, Div 1, Explosion Proof

IVC-G2Z2BPS44
Div 2, GO Switch, 24VDC solenoid

IVC-G2Z2BP144
Div 2, GO Switch, 120VAC solenoid

IVM-G2Z2BP
Div 2, GO Switch, direct mount

IVC-D2Z2BPS44
Div 2, proximity, 24VDC solenoid

IVC-D2Z2BP144
Div 2, proximity, 120VAC solenoid

IVM-D2Z2BP
Div 2, proximity, direct mount

SSP-XPL2GR□00
Div 1, 2 GO Switches, herm seal

SSP-XPM2GR□00
Div 1, 2 mechanical SPDT

SSP-XPT2GR□00
Div 1, 2 mechanical DPDT

SXP-L2Z1GR□00000
Cenelec Zone 1, 2 GO Switches

SXP-M2Z1GR□00000
Cenelec Zone 1, 2 mechanical SPDT

SRP-4XL2GR□00
Div 2, GO Switches, herm seal

SRP-4XM2GR□00
General Purpose, 2 mechanical SPDT

SUP-GPM2GRN00
General Purpose, 2 mechanical SPDT

SEP-4XM2GR□00
General Purpose, 2 mechanical SPDT

PPS-NSZ0T1
Intrinsically Safe, 2 proximity sensors

PPS-3SGPT1
General Purpose, 2 proximity sensors

SBP-XPL2
Div 1, 2 GO Switches, linear

7LR-1356E-A2
Div 2, GO Switch, 3 ft. leads, Red LEDs

7LG-1356E-A2
Div 2, GO Switch, 3 ft. leads, Green LEDs

LPS-DZ2RA2
Div 2, proximity, Red LEDs

LPS-DZ2GA2
Div 1, proximity, Green LEDs

□ = NAMUR or Standard shaft (both in stock)

Position Sensing Products

11-11110-00
Div 2, SPDT 3/8", Side Terminals

11-12110-00
Div 2, SPDT 9/16", Side Terminals

11-12510-00
Div 2, SPDT 9/16", Bottom Terminals

11-12518-A2
General Purpose, SPDT 9/16", Side Leads

21-11110-00
Div 2, SPDT 3/8", Side Terminals

21-11510-00
Div 2, SPDT 3/8", Bottom Terminals

21-11516-A2
Div 2, SPDT 3/8", Bottom Leads

21-11524-A2
Div 1, SPDT 3/8", Bottom Leads

35-13319-A2
Valve Position Sensor, herm seal

73-13523-A2
Div 1, SPDT, stainless, 3 ft. leads

73-13524-A2
Div 1, SPDT, stainless, 3 ft. leads

73-13526-A2
Div 2, SPDT, stainless, 3 ft. leads

73-13528-A2
General Purpose, SPDT, 3 ft. leads

73-13528-DCA
General Purpose, SPDT, Mini Connector

74-13528-B2
General Purpose, SPDT, 3 ft. cable

74-13528-DBA
General Purpose, SPDT Micro Connector

7G-23523-A2
Div 1, DPDT, stainless, 3 ft. leads

7G-23526-A2
Div 2, DPDT, stainless, 3 ft. leads

81-20524-A2
Div 1, DPDT 1/4", Bottom Leads

81-20516-A2
Div 1, DPDT 1/4", Bottom Leads

Look for the checkmark!
It denotes our most popular options.

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Field Networking Solutions

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Field Networking 101

The combination of intelligent field devices, digital bus networks, and various open communications protocols is producing extraordinary results at process plants around the world.

Just as our ability to retrieve, share, and analyze data has increased tremendously by use of the Internet and PC network technology in our homes and at our desktops, so has our ability to control and manage our process plants improved. Digital connectivity in process manufacturing plants provides an infrastructure for the flow of real-time data from the process level, making it available throughout our enterprise networks. This data is being used at all levels of the enterprise to provide increased process monitoring and control, inventory and materials planning, advanced diagnostics, maintenance planning, and asset management. These digital networks are generally referred to as a "fieldbus network."

Today's advanced and scalable process control systems allow for multiple fieldbus networks to be deployed simultaneously using one engineering tool. This provides for a high degree of flexibility in control options and allows users to install the required devices and bus functionality for a specific control task. Proper selection and deployment of fieldbus networks are providing unprecedented results in process plants worldwide.

Features and Benefits of Fieldbus Networks

Fieldbus networks provide an array of features and benefits that make them an excellent choice in nearly all process control environments.

Compared to conventional technology, fieldbus networks deliver the following benefits:

Reduced field wiring costs
- Two wires from the control room to many devices

Reduced commissioning costs
- Less time and personnel needed to perform I/O wiring checkouts
- No time spent calibrating intermediate signals (such as 4-20mA signals)
- Digital values are delivered directly from field devices, increasing accuracy

Reduced engineering/operating costs
- Much smaller space required for panels, I/O racks, and connectivity boxes
- Fewer I/O cards and termination panels for control system equipment
- Lower power consumption by control system hardware

Reduced maintenance costs
- Diagnostics are predictive and delivered directly to the control and maintenance systems

Interoperability of different manufacturers
- Open architectures provide much easier and faster integration of a multiple vendor control strategy

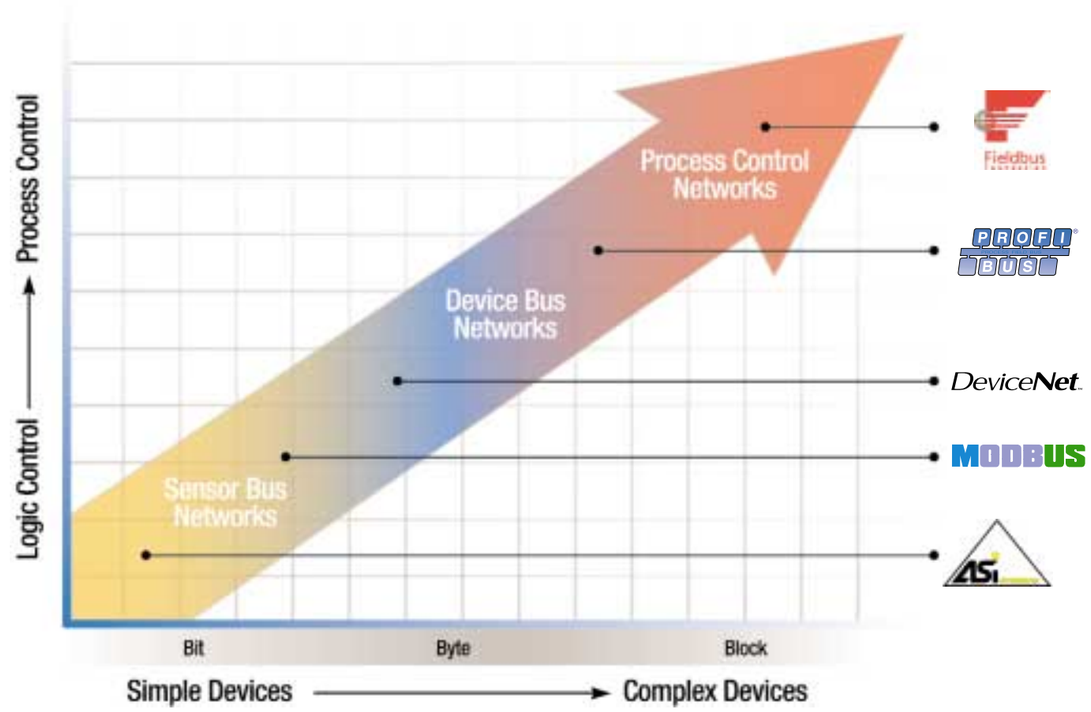
More production uptime
- Initial commissioning and startup is much easier and faster than with conventional systems
- Maintenance and shutdown periods can be planned and minimized, increasing productivity

Bus Network Overview

	Ease of Use	Richness of Info.	Intrinsically Safe	Device Cost	Installed Cost*	Operating Cost
FOUNDATION Fieldbus	High	High	Yes	High	High	Low
Profibus–PA	Medium	High	Yes	High	High	Low
Profibus–PB	Medium	Medium	No	Medium	Medium	Medium
DeviceNet	Medium	Medium	No	Medium	Medium	Medium
Modbus	Medium	Low	No	Medium	Medium	High
AS-Interface	High	Low	No	Low	Medium	High

* Total system, field device, and wiring costs in a Zone 2 (Class I, Div 2) hazardous area.

TYPES OF FIELDBUS NETWORKS*



Sensor Bus Networks

At the lowest level of process automation, the Sensor Bus is a low-cost way to extend the benefits of networking to simpler devices and still be able to connect with higher-level protocols using gateways.

Sensor busses focus solely on discrete devices and offer little connectivity for analog inputs.

AS-i (Actuator Sensor Interface) is the most common Sensor Bus worldwide.

Field devices typically connected to Sensor Bus Networks include on/off valves, limit switches, solenoid valves, and pressure, temperature, level, and flow switches.

Device Bus Networks

Moving up a level in complexity, device busses provide for control of complex discrete devices and equipment power. Device Bus Networks are typically used for connectivity in areas with a high density of discrete devices, variable speed drives, and motor control centers.

The most commonly used Device Bus Networks include DeviceNet and Profibus-DP.

DeviceNet is used extensively in factory automation and is also proving useful in process automation.

Field devices typically connected to Device Bus Networks include on/off valves, motor control centers, variable frequency drives, and numerous discrete sensors and actuators.

Process Control Networks

Process Control Networks are the most advanced fieldbus networks in use today. They provide connectivity of sophisticated process measuring and control equipment. While more complex in functionality, today's process control networks can be easily deployed for new or existing process equipment, and today's engineering tools allow for correct, efficient design. The advanced characteristics of the host interfaces and devices make connectivity, addressing, and commissioning much simpler than conventional devices.

FOUNDATION Fieldbus is emerging as a leader at this level, with strong market share in North America and increasing share throughout the world. Profibus PA is also a viable alternative, with particularly good acceptance in Europe.

Field devices typically connected to Process Control Networks include control valves, temperature and pressure transmitters, level measurement equipment, flow meters, process analytical instruments, and on/off valves where appropriate.

Did You Know?

TopWorx has experience and expertise in a variety of bus protocols, including AS-Interface, FOUNDATION Fieldbus, DeviceNet, Profibus and Modbus.

* Modified version of a graph by Automation Research Corporation

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Fieldbus Network Architecture

Today's process automation systems begin with low-cost, commercial PC-based technologies, then connect to proven fieldbus protocols appropriate for a variety of applications.

The result? Precise control, predictive maintenance, and rich information - a proven recipe for improving process plant performance.

Did You Know?

TopWorx offers an array of networking support services, including fieldbus network selection, design and implementation, as well as several training classes.

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The Batch Process

Batch processes contain a dense population of discrete and analog devices, and are well suited for multiple busses: a sophisticated Process Control Network for analog instrumentation, and a simpler Sensor or Device Bus Network for discrete devices.

TopWorx field networking solutions enable seamless integration of multiple busses in a single application.

Key

- Lumitech Discrete Valve Controller
- Switchpak Discrete Valve Monitor
- HazLink Input/Output Module
- GO Switch Leverless Limit Switch
- HazLink Disconnect Switch
- AS-Interface Network Cable
- Conventional Wiring
- FOUNDATION Fieldbus Cable
- HazLink Wiring Tee

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Key

- Lumitech Discrete Valve Controller
- Networx Connection Module
- HazLink Input/Output Module
- GO Switch Leverless Limit Switch
- Conventional Wiring
- FOUNDATION Fieldbus Cable
- Intrinsic Safe Barrier/Repeater

The Continuous Process

Continuous processes use sophisticated process measurement and flow control devices, and are well suited for Process Control Networks such as FOUNDATION Fieldbus or Profibus PA.

TopWorx field networking solutions make it easy to connect analog and discrete devices into high level Process Control Networks.

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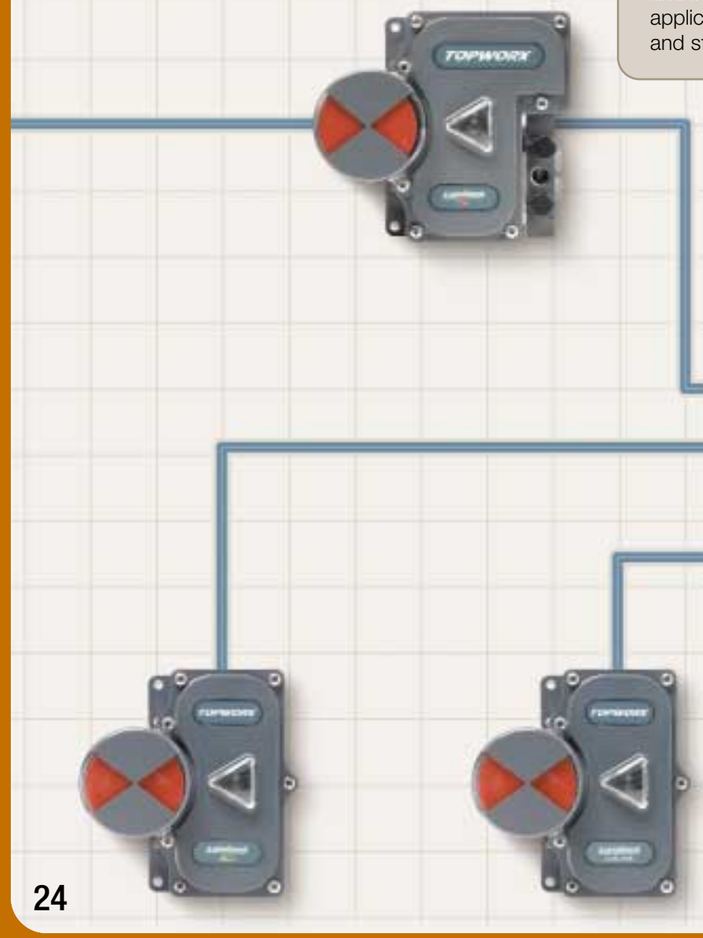
The TopWorx Field Networking Program

With our experience in process plants and expertise in bus networking, TopWorx has created Networx™ - the most complete, customer-focused, cost-effective field networking solutions available anywhere.

Complete
Networx is a comprehensive, single solution with everything you need to build a modern network.

Networx field networking products bridge the gap between process control systems and field devices, minimizing installation costs and maximizing uptime and productivity.

And Networx support services help select, design, and implement the right bus network for your application, ensuring fast, easy commissioning and start-up, and trouble-free operation.



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Complementary
Networx complements global process control system suppliers like Emerson Process Management, Rockwell Automation, Honeywell, ABB, Seimens, Yokogawa, Smar, and Foxboro with practical solutions that help customers implement field-bus technology more effectively.

In fact, several of these companies have shown their trust in TopWorx by frequently recommending our products and services to meet customers' needs.

Customer-Focused
Networx is a direct response to the needs of today's process plants. The focus of the program is to deliver practical networking solutions that help take the architecture into the field effectively and affordably.

Networx field networking solutions focus on the process field environment – where the real work gets done.

Outstanding Value
Networx is so complementary to today's control architectures, so practical for field personnel, so simple to install and maintain, and so cost-effective that it is hard to justify not using it.

Interactive demo of how Networx can reduce costs in your plant.

www.topworx.com

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Field Networking Solutions Overview

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Masters & Gateways

Masters provide control functions for sensor level bus networks and devices. Gateways provide the necessary protocol translation that enables the connection of sensor level busses to higher level busses.

Gateways become a node on the higher-level network and a Master for the sensor level bus. Masters and Gateways allow users the flexibility to easily deploy multiple fieldbus networks that correctly match their device and application requirements.

With Masters and Gateways, end-users may eliminate the cost of having multiple home run network cables from the Control System to the field devices, while still deploying cost-effect sensor bus devices in the field.

Masters and Gateways perform the following functions:

- Initialize the network
- Identify field devices
- Diagnose the network
- Control field devices

I/O Modules, Tees & Disconnect Switches

Often there is a need to connect conventional (non-bus) devices to a network. Our Input/Output modules do just that by enabling users to connect conventional analog and discrete devices to their industrial fieldbus networks.

I/O Modules allow users to cost-effectively use new or existing conventional devices in their fieldbus design.

Wiring Tees make it easy to connect field devices to bus lines using wire terminals or plug-in connectors.

Disconnect Switches enable users to repair or replace a field device, without disturbing the network, with the simple flip of a lever-operated switch.

I/O Modules, Wiring Tees and Disconnect Switches are available as stand-alone products or inside HazLink connectivity enclosures.

HazLink™ Connectivity Enclosures

Most bus networks were originally designed to be used for factory automation rather than process automation. Therefore, in the process industries there has been a need for easy, cost-effective ways to make wiring connections in hazardous areas.

Our HazLink™ products are rugged connectivity enclosures that provide flexible wiring options in hazardous areas.

Options include:

- I/O Modules
- Wiring Tees
- Disconnect Switches

Power Supplies & Repeaters

TopWorx provides power supplies to meet every field network requirement. Since each bus protocol has its own power and data specification, TopWorx offers the appropriate power supplies required for the intended protocols.

Our selection includes:

- Bulk power supplies for control system and device level power needs
- Bus-level power supplies and conditioners for network communications isolation
- Repeaters for extending network power and communication limits

Cables, Connectors & Cordsets

Proper wiring, termination, and connectivity are the framework of any bus or network solution. Since the vast majority of networking problems occur at the physical layer, the proper wiring and connection techniques help to keep your fieldbus network robust and problem free.

Whether you choose plug-in style connections or terminal screw connections, TopWorx offers a vast selection of connectivity options to meet your needs. We offer bulk cabling, field installable connectors, linking modules, tees, terminators, and pre-molded cordsets that meet the specifications of your fieldbus network.

Networx Support Services

As part of our Networx program, TopWorx offers a system of support services to help process plants understand and implement bus networking technologies.

Networx Support Services can help:

- Select the appropriate bus network for your application
- Map out an accurate I/O plan
- Design a sound architecture and implementation plan
- Configure and connect the field devices
- Commission and start-up the process
- Support the operation all day every day
- Troubleshoot any potential problems

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Field Networking Quick Selection Guide

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Lumitech DVM
see page 132

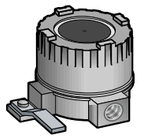
Switchpak DXS
see page 136

Lumitech DVC
see page 130

Switchpak DXP
see page 134

Sensor-Communications Module

Masters & Gateways



HazLink Connectivity Enclosures

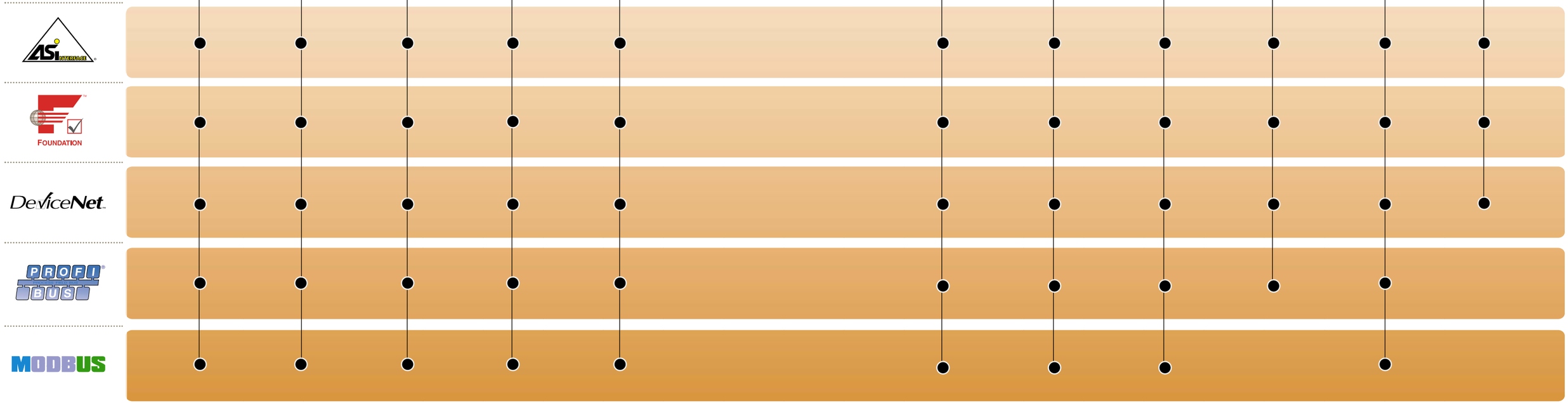
I/O Modules & Wiring Tees

Power Supplies & Repeaters

Cables, Connectors & Cordsets

Support Services
see page 30

Bus Network



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Networx Support Services

Experience in process plants. Expertise in bus networking. Exceptional support for you.

With all of the attention given recently to the benefits of bus technology, many process manufacturers are excited about the potential results that sound so promising. But often they lack the resources and time to educate themselves on all of the new buzzwords and technologies that have suddenly become so important.

The fact is, many process manufacturers are ready to reap the rewards available through bus networking technologies, but they don't always know how to do it, or even where to turn for help.

Enter TopWorx. As part of our Networx portfolio of field networking solutions, we have created a system of support services to make it easier for plant personnel to understand, implement, and enjoy the benefits of bus networking technologies.

With Networx Support Services, you know where to turn for help.

Networx Support Services

Experience + Expertise wherever and whenever you need it.

In the processing industries, availability is critical to success. And most process plants operate 24 hours a day, 7 days a week. So part of the vision of Networx Support Services is to make sure that if you need help, you can get it wherever and whenever you need it.

That's why we have created a support structure to serve the needs of process plants. Whether you need training for your personnel, configuration of your devices, or quick answers during a start-up, Networx Support Services can help deliver the kind of support you need.

An important part of Networx Support Services is the partnerships that TopWorx enjoys with hundreds of companies around the world. These partnerships give TopWorx customers an array of choices to meet their unique needs.

To ensure consistent delivery of superior service from our channel partners to our customers, TopWorx has created a channel certification and specialization program for the selection, education, and certification of our partners.

Channel Specialization
By setting high standards for our partners in specialized areas of expertise such as bus networking, valve automation, and systems integration, TopWorx makes sure that its customers receive only the highest quality of support.

Channel Certification
Only those partners who meet certain rigid criteria can become or continue to be a Certified Channel Partner. Periodic reviews ensure that partners in fact have the expertise, capabilities, and customer commitment required by our customers and set forth in our partnership agreements.

Types of TopWorx Channel Partners include:

Certified Product Distributor TOPWORX

These partners are authorized to sell and support one or more of the three TopWorx product groups: field networking, valve control, or position sensing products.

Certified Service Provider TOPWORX

These partners are qualified to deliver Networx Support Services to our customers on behalf of TopWorx.

Certified Product Integrator TOPWORX

These partners are able to integrate one or more of the three TopWorx product groups into larger, more sophisticated control architectures and automated systems.

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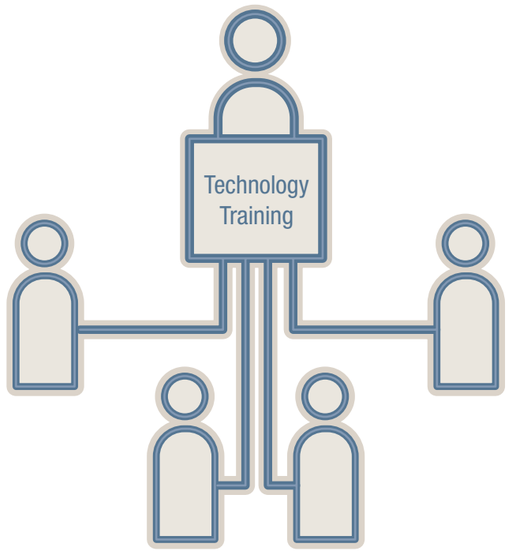
Networx Support Services

Technology Training delivers practical knowledge of bus networking.

Process plants sometimes lack the resources necessary to keep pace with rapidly changing technology and its impact on competitive strategy. Therefore, the key to success often is a company's ability to quickly deliver technical knowledge to its personnel and convert that knowledge into practical solutions that can be applied to field operations.

As part of our Networx Support Services, TopWorx has created a means to deliver knowledge to your employees. We offer a number of training classes and seminars to educate staff personnel on the theories, realities, and practicalities of modern bus networking technologies, including AS-Interface, FOUNDATION Fieldbus, DeviceNet, and Profibus.

Our technology training program is building rapidly. New locations, dates, and courses are being added occasionally, so please visit our website at **www.topworx.com** for more updated learning opportunities.



Technology Training

NSS - TT101
Discovering Bus Networking

This course covers the world of bus networking using simple, easy to understand terms, and provides the basics that everyone should know about today's most prominent bus protocols. At the end of the course, the student will see the benefits of modern bus technologies and the differences among the major protocols. The student will also understand how bus networking technologies improve the performance of process plants, and which bus or busses will deliver the quickest return on investment in his or her specific application.

Overview of Bus Networks
- Terminology and networking "buzzwords"
- Sensor Bus Networks (AS-Interface)
- Device Bus Networks (DeviceNet, Profibus DP)
- Process Control Networks (FOUNDATION)

Comparison of Bus Networks
- Common benefits of all bus networks
- Differences in various bus networks
- When and where to use each technology

Choosing the Appropriate Bus Network
- Which bus is right for you?

NSS - TT1AS
Practical AS-Interface

This course covers the practical issues of implementing an AS-i bus network. At the end of the course, the student will be able to design an AS-i system, select the proper components to build the network, and configure and connect AS-i and conventional field devices to the network. He or she will also have a solid understanding of proper AS-i wiring practices in hazardous areas, as well as an appreciation for the financial aspect of project justification.

Overview of AS-Interface
- Key features and benefits of AS-i
- When to use AS-i
- Topologies, cable types, and constraints
- Components required to build an AS-i network

Hands-on AS-Interface
- Design an AS-i network
- Wire and configure masters, gateways, and devices
- Installation techniques in hazardous areas

Economics of AS-Interface
- Quantifying potential savings
- Justifying an AS-i project

NSS - TT1FF
Practical FOUNDATION Fieldbus

This course covers the practical issues of implementing FOUNDATION Fieldbus segments. At the end of the course, the student will be able to design fieldbus segments, select the proper components to build the segments, and configure and connect FF field devices to the network. He or she will also have a solid understanding of proper wiring practices when applying FF in non-incendive, explosion-proof, and intrinsically safe hazardous areas.

Overview of FOUNDATION Fieldbus
- Theory of FF technology
- Key features and benefits of FF
- Topologies, cable types, and constraints
- Components required to build FF segments

Hands-on FOUNDATION Fieldbus
- Design of FF segments - power, voltage, device load constraints
- Wire and configure devices to a process control system
- Installation in hazardous areas

Economics of FOUNDATION Fieldbus
- Quantifying potential savings
- Justifying an FF project

NSS - TT1DN
Practical DeviceNet

This course covers the practical issues of implementing a DeviceNet device bus network. At the end of the course, the student will be able to design a DeviceNet system, select and assemble the proper components to build the network, and configure and connect Devicet and conventional field devices to the network. He or she will also have a solid understanding of proper wiring practices in hazardous areas, as well as an appreciation for the financial aspect of project justification.

Overview of DeviceNet
- Key features and benefits of DeviceNet
- When to use DeviceNet
- Topologies, cable types, and constraints
- Components required to build a DeviceNet network

Hands-on DeviceNet
- Design a DeviceNet network
- Wire and configure devices to a process control system
- Installation techniques in hazardous areas

Economics of DeviceNet
- Quantifying potential savings
- Justifying a DeviceNet project

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AS-Interface Overview

The AS-i (Actuator Sensor Interface) protocol was created in Germany in 1994 by a consortium of factory automation suppliers. Originally developed to be a low-cost method for addressing discrete sensors in factory automation applications, AS-i has since gained acceptance in process industries due to its high power capability, simplicity of installation and operation, and low cost adder for devices.

Each AS-i segment can network up to 31 devices. This provides for 124 inputs and 124 outputs, giving a maximum capacity of 248 I/O per network on a v2.0 segment. The AS-i v2.1 specification doubles this to 62 devices per segment, providing 248 inputs and 186 outputs for a total network capacity of 434 I/O points.

Both signal and power are carried on two wires. Up to 8 amps at 30VDC of power are available for field devices such as solenoid valves.

AS-i Network Highlights

Technology Developer AS-i Consortium

Year Introduced 1993

Openness Multiple vendors
800+ products, 150 Vendors

Type of Network Sensor Bus

Physical Media 2-wire cable (flat or round)

Network Topology Bus, Ring, Tree, Star

Maximum Devices
- v2.0 31 nodes (or 248 I/O points)
- v2.1 62 nodes (or 434 I/O points)

Maximum Distance
- Maximum Distance 100 meters
- Maximum Distance with repeaters 300 meters (max. of 2 repeaters can be used)

Communication Methods
- Master/Slave with cyclic polling
- Manchester Bit Encoding implemented via Alternating Pulse Modulation (APM)

Transmission Properties
- 5 mSec latency max. on fully loaded segment

Primary usage
- v2.0 Discrete Signals
- v2.1 Discrete Signals (supports 12 bit analog signals accessed over 5 cycles)

Power and Communications on same twisted pair
- Limited to 200mA per device power consumption
- Requires AS-i specific power supply on communications bus for de-coupling

Device Power Supply
- Devices can be supplied from bus (<200mA)
- Additional power can be supplied by AS-i power bus cable having multiple power supplies (required for higher power outputs)

Wiring Types
Round: Normal 2 wire cable #16AWG (1.5mm)

Flat: 2 wire flat AS-i cable (1.5mm conductors) Yellow for communications Black for additional power

Grounding aspects Ungrounded communications bus

Shielding Unshielded wire

Terminators No terminators required

Hazardous Area Installations Explosion Proof wiring required

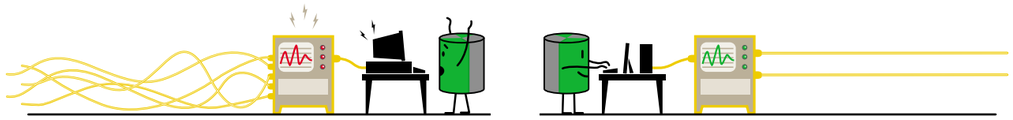
Device Addressing
- Automatic when connected one at a time to the segment or with Handheld Addressing Unit

Governing Body ATO (AS-i Trade Organization)

Web Site **www.as-interface.com**

Conventional I/O System vs. AS-i Bus Network

AS-i is so simple and so inexpensive that it makes using traditional wiring methods difficult to justify.



CONVENTIONAL I/O SYSTEM

Advantages
- Technology is already understood
- Slightly lower device cost
- Independent wiring from devices to the control system means wiring problems with one device don't affect other field devices

Drawbacks
- Higher installed cost
- Point-to-point wiring is expensive
- Many wiring connections:
  - are labor intensive to install
  - create many points of failure
  - increase complexity when troubleshooting
  - require large amounts of cabinet or rack space for installation of terminal blocks
  - create time-consuming initial checkout and startup
- Expansion requires duplicating the entire wiring scheme for each additional point

AS-i BUS NETWORK

Advantages
- Technology is easy to understand
- Very low device cost adder
- Lower installed cost
- High speed network for sensor level devices
- Ability to integrate conventional devices into AS-i network
- Easy addressing for devices; auto-addressing capabilities on most masters
- Many gateways available to integrate AS-i network into higher-level networks, allowing for easy integration of a lower cost, sensor level network with a more sophisticated, higher-cost control level network
- AS-i network provides for use of higher power devices
- Easily expandable with network redesign
- Requires no terminators or special shielding requirements yet still less susceptible to RFI interface than some networks
- Wide variety of masters/gateways available for PLC's, DCS's, PC's
- Power and bus communications are on same pair of wires
- Wide variety of topologies available, including point-to-point, line, tree, and ring

Drawbacks
- Not available for Intrinsically Safe applications
- Wiring runs limited to 100 meters
- v2.0 supports only discrete devices (v2.1 has limited analog support)
- No control in the field
- Limited data quality and status messaging
- Limited analog support
- Requires specific AS-i power supply for bus communications isolation
- Limited redundancy capabilities

AS-i is inexpensive, simple, supplies plenty of power and offers end users a variety of wiring strategies.

TopWorx Comments on AS-i

Strengths
AS-i is inexpensive, especially in general purpose environments.

AS-i is simple. Unlike other communication protocols, AS-i is not designed to bring control system functionality to the field. AS-i is simply a better way to connect field devices to the control system. AS-i offers end users a variety of topologies (wiring strategies). And AS-i's principle of operation makes it easy to install and configure as well as add new devices later.

AS-i supplies plenty of power. AS-i delivers plenty of power to operate virtually all field devices, including solenoid valves.

Limitations
Wiring length
The maximum length of cable run is limited to 100 m per segment. Up to two repeaters can be added to increase this length to 300 m.

Hazardous Areas
Since AS-i is an 8 amp bus, it cannot be intrinsically safe. TopWorx has recognized the difficulties of installing AS-i in hazardous areas and offers a variety of solutions suitable for use in Class I, Div 1 (Zone 1) and Class I, Div 2 (Zone 2) environments.

When to Use AS-i
Generally speaking, TopWorx recommends AS-i when:
- device populations are all discrete
- plants are not intrinsically safe
- cable length limitations are not an issue
- users desire the ultimate in simplicity
- existing discrete devices need to be incorporated into a bussed environment
- conventional discrete devices need to be incorporated into a bus network
- large numbers of discrete devices need to be cost-effectively incorporated into an existing control level network via a gateway device

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Sensor Bus Network

AS-Interface Sensor-Communications Module

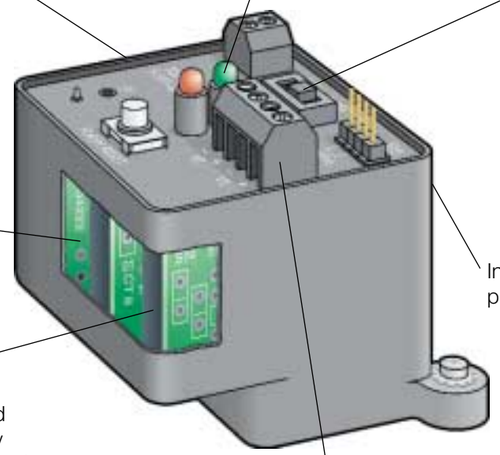
The TopWorx Sensor-Communications Module (SCM) combines position sensors, AS-i communication, solenoid outputs, and wiring terminals into a compact enclosure that is potted and sealed from the environment.

SCM-ASi enclosure is **resistant to high levels of impact, moisture, shock, and vibration.**

Britelite LEDs indicate valve position and facilitate sensor set up.

Calibration Switch facilitates initial setup. The three position On-Off-ASi switch enables the valve to be test cycled open and closed offline, then put onto the network when ready.

All electronics are **short-circuit protected,** eliminating the expense of adding separate short-circuit protection.



Integrated position sensors provide valve position feedback.

All micro-processor based electronics are completely **potted and sealed,** preventing premature failure due to moisture or contamination.

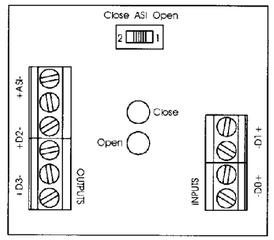
Onboard terminals provide connection points for **auxiliary discrete inputs.**

SCM-ASi Highlights

The Sensor-Communications Module delivers valve position feedback, communicates directly on the AS-Interface network, pilots the valve actuator, and provides extra wiring terminals for auxiliary inputs.

The TopWorx SCM-ASi is a compact, sealed module that can be used in a variety of enclosures suitable for use in any hazardous or corrosive process environment.

2 Discrete Inputs (DI)	Open/Closed valve position feedback
2 Discrete Outputs (DO)	Solenoid outputs for single or double acting
Calibration Switch	Open-Close-ASi
BriteLite LEDs	Open, Closed
Conformance Tested	Yes
Short Circuit Protection	Yes
Maximum Output Current	160mA per output
Maximum Output Power	4 watts per output
Voltage	24-30 VDC



SCM-ASi Wiring Diagram

The AS-i Sensor-Communications Module fits conveniently into a variety of valve control enclosures suitable for any process environment.

Lumitech DVC-ASi

Discrete Valve Controller
- Zone 2, (Class I, Div 2)
- Integral Solenoid Valve
- Direct Mount

See page 130 for more details.

Did You Know?

TopWorx makes it easy to use AS-Interface in hazardous areas. HazLink connectivity enclosures offer multiple explosion proof wiring options, and Switchpak valve controllers and monitors are suitable for use in Zone 1 (Class I, Div 1) hazardous areas.

Lumitech DVM-ASi

Discrete Valve Monitor
- Zone 2 (Class I, Div 2)
- Direct Mount

See page 132 for more details.

Switchpak DXP-ASi
Switchpak DXS-ASi (Stainless Steel enclosure)

Discrete Valve Monitor
- Zone 1 (Class I, Div 1)

See page 134, 136 for more details.

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The AS-Interface sensor bus network was originally designed to be used for factory automation rather than process automation. Therefore, in the process industries there has been a need for easy, cost-effective ways to make wiring connections in hazardous areas.

Our HazLink products are rugged junction enclosures that provide flexible wiring options in hazardous areas, making AS-Interface more suitable for use in the process industries.

HazLink Features: Zone 1 (Class I, Div 1)
(3) 3/4" NPT conduit outlets

HazLink Options: I/O Modules
Wiring Tees
Disconnect Switches

Item

HazLink Connectivity Enclosure

General Specifications

Enclosure: Die-cast aluminum; O-ring sealed

Coating: Dichromate conversion (inside); powder polyester coating (outside)

O-rings: Buna N

Cover: Screw cover with O-ring seal

Conduit Outlets: Three 3/4" NPT

Environment: NEMA Type 4, 4X, 7 and 9

Approvals: Explosion Proof
Zone 1
Class I, Div 1 & 2, Groups A,B,C,D
Class II, Div 1 & 2, Groups E,F,G

c UL us LISTED

CE

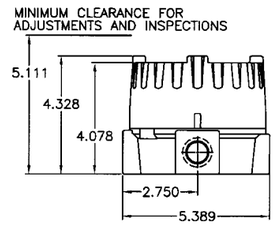
I/O Modules

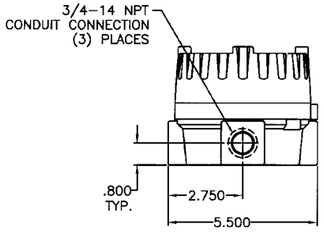
HazLink I/O Modules allow users to cost-effectively connect new or existing conventional devices into the AS-Interface network in Zone 1 (Class I, Div 1) hazardous areas.

NHL-ASIO Hazlink Connectivity Enclosure with AS-Interface I/O
2 input, 2 output knifegate valve or cylinder controller

AS-Interface

Dimensions



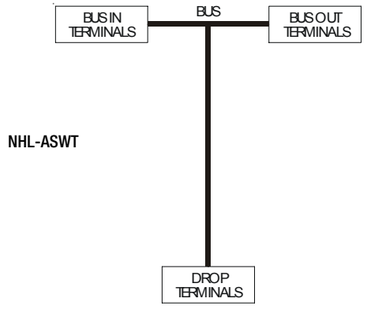


Wiring Tees

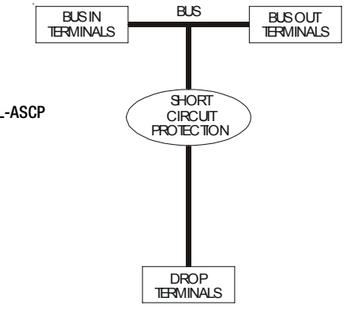
HazLink Wiring Tees make it easy to connect field devices to bus lines using wire terminals or plug-in connectors.

NHL-ASWT AS-Interface tee with 3 x 2 position wiring terminals

NHL-ASCP Short circuit protection



NHL-ASWT



NHL-ASCP

Disconnect Switches

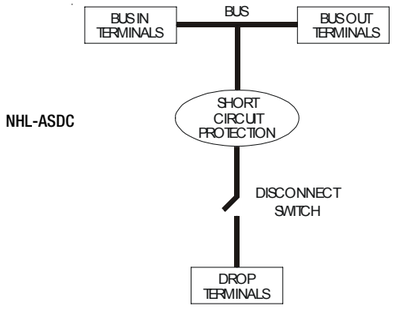
HazLink Disconnect Switches enable users to repair or replace a field device without disturbing the network with the simple flip of a lever-operated switch.

Disconnect Switches are designed to be locked if desired. Locking prevents tampering or accidental device connection or disconnection.

TopWorx offers Disconnect Switches in HazLink enclosures with or without short circuit protection.

NHL-ASDS Disconnect switch

NHL-ASDC Disconnect switch with short circuit protection



NHL-ASDC

AS-i to Modbus Gateways

502.969.8000

AS-i to Modbus Gateways control the field devices on the AS-Interface network, and connect the AS-i network to the Modbus protocol via RS 232C, RS 422, or RS 485 serial interface.

General Specifications

Operating Temperature: 32° to 131°F (0° to 55°C)
Voltage of insulation: ≥ 500V
Protection Category: Housing IP40, Terminals IP20

Item

AS-i to Modbus Gateways

Gateways function as a master on the AS-i network and as a single node on the Modbus network.

Dual Gateways function as two complete masters on the AS-i network and as a single node on the Modbus network.

These devices include demonstration software that performs addressing, monitoring, and diagnostics of the network.

Additional Specifications

AS-i Specification: 2.1 (Gateways); 2.0 (Dual Gateways)

With AS-i Power Supply

Operating Voltage: 30VDC AS-i voltage

Operating Current:
Single Gateways: 200mA (from AS-i)
Dual Gateways: 200mA (from AS-i 1), 70mA (from AS-i 2)

With Standard Power Supply

Operating Voltage: 24VDC

Operating Current: 70mA (from AS-i), 150mA at 18VDC (from power)

Check it out! - D-sub-data transmission cords, page 117

Part Number & Description

Single Gateways

	Serial Interface	Power Supply
NAS-GM11	RS 232C	AS-i
NAS-GM12	RS 232C	Standard
NAS-GM13	RS 485	AS-i
NAS-GM14	RS 485	Standard
NAS-GM15	RS 422	AS-i
NAS-GM16	RS 422	Standard

Dual Gateways

	Serial Interface	Power Supply
NAS-GM21	RS 232C	AS-i
NAS-GM22	RS 232C	Standard
NAS-GM23	RS 485	AS-i
NAS-GM24	RS 485	Standard
NAS-GM25	RS 422	AS-i
NAS-GM26	RS 422	Standard

AS-i to DeviceNet Gateways

TOPWORX

AS-i to DeviceNet Gateways provide a means of easily connecting an AS-i network to a higher level DeviceNet network. The Gateway is recognized as a single node on the higher level DeviceNet network while controlling the field devices on the AS-Interface network.

General Specifications

Operating Temperature: 32° to 131°F (0° to 55°C)
Mounting: DIN rail
Voltage of insulation: ≥ 500V
Protection Category: Housing IP40, Terminals IP20

Item

AS-i to DeviceNet Gateways

Gateway

Gateway with graphical display

Functions as a master on the AS-i network and as a single node on the DeviceNet network.

These devices include demonstration software that performs addressing, monitoring, and diagnostics of the network.

Additional Specifications

Single Gateways

Operating Voltage: 30VDC AS-i voltage

Operating Current: 200mA (from AS-i circuit)

Dual Gateways

Operating Voltage: 24VDC

Operating Current: 200mA (from AS-i 1), 70mA (from AS-i 2)

Check it out! - D-sub-data transmission cords, page 117
- Master simulators for testing, page 78

Part Number & Description

	Graphical Display	# AS-i Masters	AS-i Specification
NAS-GD01	Yes	Single	2.1
NAS-GD02	Yes	Dual	2.1
NAS-GD03	No	Single	2.0

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AS-i to Profibus DP Gateways

502.969.8000

AS-i to Profibus DP Gateways provide a means of easily connecting an AS-i network to a higher level Profibus DP network. The Gateway is recognized as a single node on the higher level Profibus DP network while controlling the field devices on the AS-Interface network.

General Specifications

Operating Temperature: 32° to 131°F (0° to 55°C)
Mounting: DIN rail
Voltage of insulation: ≥ 500V
Protection Category: Housing IP40, Terminals IP20
AS-i Specification: 2.1

Item	Part Number & Description

AS-i to Profibus DP Gateways

Gateway

Gateway with graphical display

Functions as a master on the AS-i network and as a single node on the Profibus DP network.

Dual Gateways function as two complete masters on the AS-i network and as a single node on the Profibus DP network.

These devices include demonstration software that performs addressing, monitoring, and diagnostics of the network.

Additional Specifications

Connection Type: Screw terminals

Gateway

Operating Voltage: 30VDC AS-i voltage

Operating Current: 200mA (from AS-i circuit)

Dual Gateway

Operating Voltage: 24VDC

Operating Current:
AS-i Power: 200mA (from AS-i 1), 70mA (from AS-i 2)
Standard Power: 70mA (from each AS-i), 150mA at 18VDC (from power)

Check it out!
- D-sub-data transmission cords, page 117
- Master simulators for testing, page 99

Single Gateways

	Graphical Display	Power Supply
NAS-GP11	Yes	AS-i
NAS-GP12	No	AS-i

Dual Gateways

	Serial Interface	Power Supply
NAS-GP21	Yes	AS-i
NAS-GP22	No	AS-i
NAS-GP23	Yes	Standard
NAS-GP24	No	Standard

AS-i to Ethernet TCP-IP Dual Gateways

TOPWORX

Dual AS-i to Ethernet Gateways control the field devices on the AS-Interface network, and connect the AS-i network to Ethernet TCP-IP. The Dual Gateway controls two AS-i networks and appears as a single node on Ethernet.

General Specifications

Operating Temperature: 32° to 131°F (0° to 55°C)
Voltage of insulation: ≥ 500V
Protection Category: Housing IP40, Terminals IP20
AS-i Specification: 2.1

Item	Part Number & Description
NAS-GE01	AS-i to Ethernet Dual Gateway using AS-i power supply

AS-i to Ethernet TCP-IP Dual Gateways

Functions as two complete masters on the AS-i network and as 256 bit digital I/O module per the AS-i network for Ethernet. Modbus is used as the fieldbus application layer.

These devices include demonstration software that performs addressing, monitoring, and diagnostics of the network.

Additional Specifications

Operating Voltage: 18.0 to 31.6VDC

Operating Current:
AS-i Power: 200mA (from AS-i 1), 70mA (from AS-i 2)
Standard Power: 70mA (from each AS-i), 150mA at 18VDC (from power)

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Quick Disconnect I/O Modules

502.969.8000

Input/Output Modules are used to interface conventional devices with an AS-i network bus using Quick Disconnect (QDC) style connectors.

General Specifications

Protection Class: IP67

Item	Part Number & Description

Heavy Duty I/O Modules

These modules provide QDC connectors for input and output devices. The AS-i bus communication and external power cables can be connected via QDC style connector or AS-i flat cable using piercing technology. These modules have outputs rated at a total of 2A.

Additional Specifications

Operating Temperature: -13° to 158°F (-25° to 70°C)

Material: PA6-GF30; nickel-plated brass connectors

No. of Pins: 4

Quick Ship! - Connectors & Cordsets, page 49-50
- Power Supplies, pages 48 & 116

NAS-1A01	4 discrete inputs
NAS-1A02	2 discrete inputs and 2 discrete outputs
NAS-1A03	4 discrete inputs and 4 discrete outputs
NAS-1A04	4 discrete outputs

Passive Junctions

These junctions provide an easy method of connecting and expanding an AS-i network using AS-i round cable and QDC style connectors. QDC connectors allow for easy connecting and disconnecting of the device and prevent accidental shorting of communication and power wiring.

Additional Specifications

Operating Voltage: 300V

Operating Current per Conductor: 9.0A (minifast), 4.0A (eurofast)

Operating Temperature Range: -22° to 176°F (-30° to 80°C)

Material: Die-cast aluminum, black powder coated

Receptacle Housing: Stainless steel

No. of Pins: 4

NAS-1B01	8 ports, eurofast, with minifast trunk connectors [1]
NAS-1B02	8 ports, eurofast
NAS-1B03	6 ports, eurofast
NAS-1B04	4 ports, eurofast
NAS-1B05	8 ports, minifast

[1] **Operating Temperature**: -13° to 158°F (-25° to 70°C)
Material: Black nylon
Receptacle Housing: Nickel-plated brass

I/O Modules & Couplers

TOPWORX

AS-Interface

These standard consortium-style Input/Output modules are used for interfacing conventional devices with an AS-i network. I/O modules must be combined with a coupler to use either round or flat AS-i bus cable.

General Specifications

Operating Temperature: -13° to 158°F (-25° to 70°C)
Protection Class: IP67

Quick Ship! - AS-i specific power supplies, page 48

Item	Part Number & Description

Standard User I/O Modules

Input Modules are used for connecting conventional discrete devices to an AS-Interface.

Output Modules are used to connect conventional discrete actuators to an AS-Interface.

These Output Modules can supply 200mA total from the AS-Interface. Supplemental Power is required for higher current devices.

Quick Ship! - User coupler modules, below

Input Modules

NAS-2A11	4 inputs, 100mA
NAS-2A12	4 inputs, 200mA
NAS-2A13	4 inputs, 100mA, SPDT
NAS-2A14	4 inputs, 200mA, SPDT

Output Modules

NAS-2A21	4 relay outputs, 1A with supplemental power
NAS-2A22	4 relay outputs, 1A - M12 supplemental power connection
NAS-2A23	4 solid-state outputs, 2A with supplemental power - watchdog
NAS-2A24	4 solid-state outputs, 2A with supplemental power - watchdog - NPN

Combo Input/Output Modules

NAS-2A31	2 inputs, 100mA; 2 relay outputs, 1A
NAS-2A32	2 inputs 100mA; 2 relay outputs, 1A - M12 power connection
NAS-2A33	2 inputs, 100mA; 2 solid-state outputs, 2A - watchdog
NAS-2A34	2 inputs, 100mA; 2 solid-state outputs, 2A - watchdog SPDT
NAS-2A35	2 inputs, 100mA; 2 solid-state outputs, 2A - NPN

User Coupler Modules

Coupler Modules provide a base for connecting the Standard User Modules above to the AS-Interface network cabling.

They can also provide terminal block connections for a supplemental power source when using higher current discrete actuating devices.

Choose a coupler module that matches your specific AS-i wiring and output power requirements.

For Ribbon Cable

NAS-2B11	Coupler module
NAS-2B12	Coupler module with terminal for additional supply

For Circular Cable

NAS-2B21	Coupler module
NAS-2B22	Coupler module with terminal block for additional supply
NAS-2B23	Coupler module with shielded terminal
NAS-2B24	Coupler module with shielded terminal without accessories

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Junction Box I/O Modules

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These Input/Output modules provide screw terminal connections for conventional input/output devices to be connected to an AS-i network. The I/O modules are powered via the AS-i network. For modules with outputs, the outputs are powered by a conventional external 24VDC power supply that can be connected directly to the module.

General Specifications

Operating Temperature: -13° to 140°F (-25° to 60°C)
Protection Class: IP20
Mounting: DIN rail
Approvals: Class I, Div 2

Item	Part Number & Description
Junction Box I/O Modules	
	Input Modules
	NAS-3A11 4 inputs
	NAS-3A12 4 inputs with input filter
	Output Modules
	NAS-3A21 4 Form C relay outputs
	Combo Input/Output Modules
	NAS-3A31 2 inputs, 2 outputs with watchdog
	NAS-3A32 4 inputs, 4 outputs with watchdog

Additional Specifications

Output Modules

Operating Current: ≤ 40mA

Load Capacity per relay: 115VAC, 500mA
24VDC, 500mA
60VA max

Input Modules

Operating Current: ≤ 60mA, ≤ 30mA with filter

Combo Modules

Operating Current: ≤ 30mA (2 I/O), ≤ 60mA (4 I/O)

Load Capacity per output: 24VDC, 500mA
1A total (2 I/O)
2A total (4 I/O)

Don't forget! - 24VDC power supplies, page 116

Analog Stations

TOPWORX

These analog stations are compliant with AS-i specification 2.1, which provides limited support for analog devices. These modules provide 16 bit resolution of analog signals. Your AS-i master device must be AS-i 2.1 compliant.

Don't forget! - Cordsets, cable & connectors, pages 49-51
- Power Supplies, pages 48 & 116

General Specifications

Operating Temperature: 32° to 158°F (0° to 70°C)
Protection Class: IP65
AS-i Specification: 2.1
Output Stations Operating Current: <80mA total

Item	Part Number & Description
Analog Stations	
These modules provide support for non-time sensitive analog signals via an AS-Interface and are recommended for monitoring applications.	Input Stations
Up to 40mA of current is available per device from the AS-i bus or a supplemental power source.	**NAS-4A11** Two 4-20mA inputs, 1µA resolution
On input stations, power for sensors can be supplied by AS-i or an external source via the black ribbon cable.	**NAS-4A12** Two 0-10V inputs, 1mV resolution
On output stations, power for actuators can be supplied by AS-i or external voltage via the black ribbon cable.	**NAS-4A13** Four Pt100 inputs, 0.1°C resolution
	Output Stations
	NAS-4A21 Two 4-20mA outputs, 1µA resolution
	NAS-4A22 Two 0-10V outputs, 1mV resolution

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AS-i Power Supplies & Repeaters

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AS-i networks require AS-i specific power supplies to maintain proper voltage and communications on the AS-i bus.

Item	Part Number & Description
AS-i Power Supply Units  These units are DIN rail mounted. Specifications **Operating Temperature:** 14° to 158°F (-10° to 70°C) **Protection Class:** IP20 **Operating Voltage:** 115/230VAC, selectable **Output Voltage:** 29.5 to 31.6VDC	**NAS-5A01** 2.8A power supply unit **NAS-5A02** 8A power supply unit
AS-i Repeater  Repeaters can be used to extend the communications portion of an AS-i network beyond 100 m. A maximum of two repeaters may be used to achieve a maximum AS-i segment length of 300 m. The repeater can work in conjunction with the AS-I Power Extender below. Specifications **Operating Voltage:** via AS-i **Operating Current:** 60mA per segment, 120mA total **Operating Temperature:** 14° to 131°F (-10° to 55°C) **Protection Class:** IP65 **Connections:** AS-i flat or round cable	**NAS-5B01** AS-i repeater
Power Extender  Power Extenders are designed to maintain the bus power within specifications when extending an AS-i network. This device can work in conjunction with the AS-i Repeater above to extend an AS-i network beyond the standard 100 m limitation. Specifications **Operating Temperature:** 32° to 158°F (0° to 70°C) **Protection Class:** IP65 **Operating Voltage:** 30VDC **Operating Current:** <2.8A at 30V	**NAS-5C01** AS-i power extender

Field Wirable Connectors

TOPWORX

These plug-style, quick-disconnect (QDC) connectors are designed for easy installation in the field after AS-i cable has been routed through the conduit, wire-ways, panel enclosures, and other locations.

General Specifications

Operating Temperature: -40° to 185°F (-40° to 85°C)
Protection Class: IP67

Item	Part Number & Description
Minifast Connectors Additional Specifications **Housing:** Nylon, type PA 6.6 GV **Connector Insert:** Polyurethane; V2 acc. UL 94 **Contact Materials:** CuZn plated copper alloy **Coupling Nuts:** Anodized aluminum **Protection:** NEMA 1, 3, 4, 6 & 13	**NFC-MFS** Minifast field wirable straight female connector **NFC-MMS** Minifast field wirable straight male connector
Eurofast Connectors Additional Specifications **Housing:** Polyester, PBT Black **Connector Insert:** PBT; spacings to VDE 0110 Group C **Contact Materials:** Nickel plated copper alloy **Coupling Nuts:** Female - PBT; Male - Nickel Plated Brass **Protection:** NEMA 1, 3, 4 & 6p	Female Connectors **NFC-EFS** Eurofast field wirable straight female connector **NFC-EFR** Eurofast field wirable right angle female connector Male Connectors **NFC-EMS** Eurofast field wirable straight male connector **NFC-EMR** Eurofast field wirable right angle male connector

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Molded Connector Cordsets

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These cordsets provide AS-i cable with pre-installed, plug-in connectors, reducing installation time in the field.

Available in 1, 3, 5, and 10 meter lengths. Consult the factory for additional cordset lengths.

Item	Part Number & Description
Molded Connector Cordsets TopWorx offers AS-Interface molded connector cordsets in AS-i 300V PVC yellow round data cable. Cordsets are available with a molded connector on each end or with one end bare to facilitate routing of cable through conduit or panel enclosures. All double cordsets have one straight male connector and one straight female connector. See page 51 for cable specifications. **Connector Specifications** **Plug Body:** Molded polyurethane **Contacts:** Gold plated brass **Coupling Nuts:** Stainless steel **Temperature:** -40° to 158°F (-40° to 70°C) **Protection:** NEMA 1,3,4,6,13; IP67 **Rated Current:** 9.0A (minifast); 4.0A (eurofast)	**To create your cordset part number, use the chart below to select the appropriate cordset length for your application, where ☐ = cordset length.** *Example* *NAS-DE1 = 300V PVC yellow round data cable double eurofast connector cordset, 1 m* Double Connector Cordsets **NAS-DE☐** Eurofast Connectors **NAS-DM☐** Minifast Connectors Single Connector Cordsets Eurofast Connector **NAS-SEM☐** Male eurofast connector **NAS-SEF☐** Female eurofast connector Minifast Connector **NAS-SMM☐** Male minifast connector **NAS-SMF☐** Female minifast connector

Part Number ☐	Cordset Length
1	1 m
3	3 m
5	5 m
10	10 m

Consult factory for additional cordset lengths.

AS-i Bulk Cable

TOPWORX

Cable that meets the requirements of EN50170-2-2:1996 for communication up to 12 Mbaud.

Available in 30, 75, and 150 meter spools. Consult the factory for additional cable lengths.

- Field wirable connectors, page 49

Item	Part Number & Description
AS-i Bulk Cable Cable is approved for 300V. 	**To create your bulk cable part number, use the chart below to select the appropriate cable length for your application, where ☐ = cable length.** *Example* *NAS-AC1-030 = PTE yellow flat data cable in 30 meter spool* Bulk Cable Types **NAS-AC1-☐** PTE yellow flat data cable **NAS-AC2-☐** PTE black flat power cable **NAS-AC3-☐** PVC yellow round data cable **NAS-AC4-☐** PVC light gray flat data cable

Part Number ☐	Cable Length
030	30 m
075	75 m
150	150 m

Consult factory for additional cable lengths.

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Diagnostic Tools

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Our selection of diagnostic tools is designed to reduce the total cost of ownership of AS-i networks and devices.

Our AS-i addressing unit can reduce startup and commissioning time by allowing the addressing of devices prior to field installation. Our AS-i bus testers provide addressing and advanced troubleshooting functionality to allow for quick identification and correction of network problems.

Item	Part Number & Description	
Handheld Programming Unit Used to pre-program AS-i node addresses before the nodes are physically placed on the network. Light duty stations connect directly to the top portion of the unit. Heavy duty stations interface via a eurofast connection. General Specifications **Protection:** IP20 **Operating Temperature:** 32° to 122°F (0° to 50°C) **Weight:** 550g	**NAS-DT1**	Handheld programming unit
Handheld AS-Interface System Tester Used to measure, test, monitor, and address the AS-i bus and AS-i slaves for professional initial start-up and troubleshooting.  General Specifications **Protection:** IP20 (jacks); IP52 (housing) **Operating Temperature:** 14° to 122°F (-10° to 50°C)	**NAS-DT2**	AS-Interface System Tester - AS-i addressing device and tester with neck strap - NiMh rechargeable battery pack - Battery charger - Addressing cable (M12 to jack plug) - Ground cable - Hard shell carrying case - Operating instructions
Handheld Diagnosis and Addressing Tool A rugged, handy addressing and diagnosis tool for initial start-up, maintenance, and service of the AS-i network.  General Specifications **Protection:** IP20 (jacks); IP50 (housing) **Operating Temperature:** 32° to 122°F (0° to 50°C)	**NAS-DT3**	Addressing and diagnosis device - AS-i addressing and diagnosis device - Protective rubber cover and carrying strap - Connector cable set (banana plug to jack plug) - Module base with addressing socket - One set of batteries - Hard shell carrying case - Operating instructions

Notes

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FOUNDATION Fieldbus Overview

The FOUNDATION Fieldbus (FF) protocol was created in 1994 by a group of process automation suppliers. Unlike other protocols, FF was developed specifically for the process industries. It is therefore capable of handling all of the complexities of process management, including process variables, real-time deterministic process control, and diagnostics.

FOUNDATION Fieldbus features intrinsic safety, long wiring run length, and delivery of blocks of data over a two-wire system. In intrinsically safe applications, only 83mA of power are available for each segment, so it is important that field devices consume very little power. TopWorx FF products consume less than 17mA of power, so up to five devices can be used on each segment.

FOUNDATION Fieldbus is the ideal digital replacement for the traditional 4-20mA analog standard. Although it is tailor-made for analog instruments, such as control valves and transmitters, it is often appropriate for on/off valves as well. For example, in continuous processes (low discrete population), it is often logical to tie the on/off valves into the FF system rather than use conventional wiring or a completely different bus network for a small number of valves. And in batch operations (high discrete population) that are intrinsically safe, FF is often the only logical choice for networking on/off valves.

TopWorx has recognized these issues and has created several cost-effective ways to extend the benefits of FF to on/off valves and other discrete devices.

FOUNDATION Fieldbus Network Highlights

Type of Network Process Control Network

Physical Media Twisted pair, fiber

Network Topology Star, Bus

Maximum Devices
32 nodes/segment (16 nodes/segment on some Host systems)

Maximum Devices using Intrinsically Safe wiring
4-6 per repeated segment depending on power requirements of devices and the type of I.S. barrier used.

Maximum Distance
- Maximum Distance 1,900 meters
- Maximum Distance with repeaters (max. of 4 repeaters can be used) 9,500 meters

Communication Methods
- Client/server, Publisher/subscriber, Event
- Both scheduled and onscheduled communications

Primary usage
Used for analog and discrete process control devices

Power and Communications on same twisted pair
Requires FF power supply (conditioner) to protect the digital communications

Device Power Supply
Can be supplied from bus (typical)

Wiring Types
(Recommend using Type A cable only for new installations)

Type A:	Shielded Twisted Pair #18AWG (0.8mm) 1900m (6232 ft.)
Type B:	Multi-twisted Pair with shield #22AWG (0.32mm) 1200m (3936 ft.)
Type C:	Multi-twisted Pair without shield #26AWG (0.13mm) 400m (1312 ft.)
Type D:	Multi-core without twisted pairs and having an overall shield #16AWG (1.25mm) 200m (656 ft.)

Grounding aspects Wiring is ungrounded. If bus wires are grounded or shorted, communication to all devices is interrupted. (short circuit protection is recommended)

Shielding Shields should be grounded at only one point

Terminators 2 near each end of each bus segment

Hazardous Area Installations Intrinsically Safe devices available

Device Addressing Automatic when connected to segment

Governing Body Fieldbus Foundation

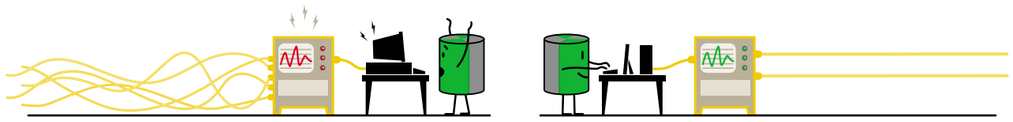
Web Site **www.fieldbus.org**

Did You Know?

The TopWorx DVC-FF has received the FOUNDATION Fieldbus "checkmark" from the Fieldbus Foundation, ensuring its interoperability with other devices and host systems.

Conventional I/O System vs. FOUNDATION Fieldbus Network

FOUNDATION Fieldbus is the ideal protocol for the process industries.



CONVENTIONAL I/O SYSTEM

Advantages
- Technology is already understood
- Lower device cost
- Independent wiring from devices to the control system means wiring problems with one device don't affect other field devices

Drawbacks
- Higher installed cost
- Point-to-point wiring is expensive
- Many wiring connections:
  - are labor intensive to install
  - create many points of failure
  - increase complexity when troubleshooting
  - require large amounts of cabinet or rack space for installation of terminal blocks
  - create time-consuming initial checkout and startup
- Expansion requires duplicating the entire wiring scheme for each additional point

FOUNDATION Fieldbus can handle process variables, deterministic process control, and diagnostics, and is the ideal protocol for the process industries.

FOUNDATION FIELDBUS NETWORK

Advantages
- Excellent support for analog I/O
- Incorporates discrete devices into same segments
- Provides control in the field capabilities
- Provides redundancy options for power and communications devices
- Available for Intrinsically Safe installations
- Largely supported by process control manufacturers
- Complete digital communications to transmitter microprocessors:
  - Eliminates inaccuracies of A/D and D/A conversions of analog representative signals, such as 4-20mA
  - Eliminates calibration of representative signals to improve accuracy
  - Eliminates setting of upper and lower range limits at the device level
- Devices contain diagnostic information and alarming capabilities
- Interoperability certification ensures that various field devices work with a variety of host systems, regardless of manufacturer

Drawbacks
- Limited power requirements in Intrinsically Safe applications, extended for FISCO installations
- Segment power, grounding, and loading must be considered when designing segments
- Training for commissioning, troubleshooting, and calibration may be required
- Requires proper grounding and power isolation for error free network communications

TopWorx Comments on FOUNDATION Fieldbus

Strengths

FF is made for process control. FF was designed by the world's leading process automation suppliers for the process industries.

FF is proven worldwide. At the time of publication, FF systems have been implemented in over 25 countries.

FF is intrinsically safe. In the processing world, hazardous areas are common. Other bus networks got their start in factory automation before migrating to the process industries, and thus often fall short in hazardous areas. But FF, designed for process automation, incorporates intrinsic safety. TopWorx solutions for discrete valves are intrinsically safe as well.

FF users want on/off solutions. Due to the sophistication of the FF protocol, occasionally a plant's on/off valves become an afterthought in the design of the system.

Later the realization hits that those valves are important, raising the question, "What are we going to do with the discretes?"

TopWorx has created several long-awaited discrete solutions that are two-wire, intrinsically safe, interoperability certified, and proven to work with process control systems such as Emerson's Delta V.

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Process Control Network

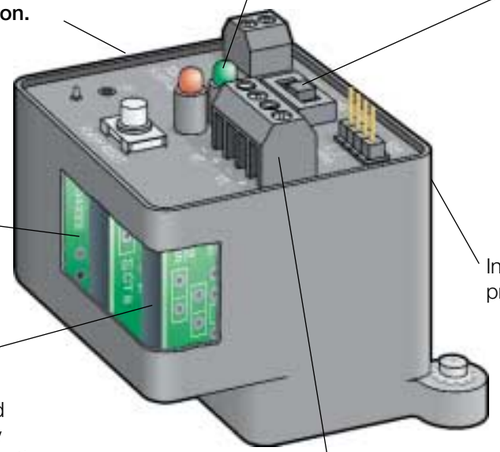
FOUNDATION Fieldbus Sensor-Communications Module

The TopWorx Sensor-Communications Module (SCM) combines position sensors, FF communication, pilot valve outputs, and wiring terminals into a compact enclosure that is potted and sealed from the environment.

Britelite LEDs indicate valve position and facilitate sensor set up.

SCM-FF enclosure is **resistant to high levels of impact, moisture, shock, and vibration.**

Calibration Switch facilitates initial setup. The three position On-Off-FF switch enables the valve to be test cycled open and closed offline, then put onto the network when ready.



All electronics are **short-circuit protected,** eliminating the expense of adding separate short-circuit protection.

Integrated position sensors provide valve position feedback.

All micro-processor based electronics are completely **potted and sealed,** preventing premature failure due to moisture or contamination.

Onboard terminals provide connection points for **auxiliary discrete and analog inputs.**

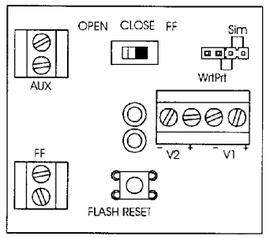
SCM-FF Highlights

The Sensor-Communications Module delivers valve position feedback, communicates directly on the FOUNDATION Fieldbus network, pilots the valve actuator, and provides extra wiring terminals for auxiliary inputs.

The TopWorx SCM-FF is a compact, sealed module that can be used in a variety of enclosures suitable for use in any hazardous or corrosive process environment.

Because of its ultra-low power requirements, the SCM-FF consumes less than 17mA of power; therefore, up to five devices can be loaded onto a single Intrinsically Safe segment.

5 Discrete Inputs (DI)	Open/Closed valve position feedback
3 Discrete Outputs (DO)	Pilot valve outputs for single or double acting
Calibration Switch	Open-Close-FF
Status/Warning LEDs	Open, Closed, Alarm State
FF Interoperability Tested	Yes
Emerson Delta V Tested	Yes
Short Circuit Protection	Yes
Intrinsically Safe	Yes
Max Current Consumption	<17mA (22mA with LEDs on full-time)
Voltage	9-32 VDC
Diagnostic Features	
Cycle Counter	Records number of cycles
Cycle Time Alarms	User settable values for Open & Close cycle times
Visual Alarm Indication	Blinking LEDs



SCM-FF Wiring Diagram

The FF Sensor-Communications Module fits conveniently into a variety of valve control enclosures suitable for any process environment.

Lumitech DVC-FF

Discrete Valve Controller
- Intrinsically Safe Zone 0 (Class I, Div 1)
- Integral Pilot Valve
- Direct Mount

See page 130 for more details.

Did You Know?

The TopWorx DVC-FF is the world's most widely used discrete valve controller for FOUNDATION Fieldbus applications.

Lumitech DVM-FF

Discrete Valve Monitor
- Intrinsically Safe Zone 0 (Class I, Div 1)

See page 132 for more details.

Did You Know?

TopWorx is an official member of Emerson Process Management's "Alliance" Program, a third-party product referencing program for qualified suppliers that complement Emerson's solutions offering.

Switchpak DXP-FF
Switchpak DXS-FF (Stainless Steel enclosure)

Discrete Valve Monitor
- Intrinsically Safe Zone 0 (Class I, Div 1)
- Explosion Proof Zone 1 (Class I, Div 1)

See page 134, 136 for more details.

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HazLink Connectivity Enclosures

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Our HazLink products are rugged junction enclosures that provide flexible wiring options in hazardous areas, making it easy to connect conventional devices to the FOUNDATION Fieldbus network as well as make wiring connections and disconnect field devices in hazardous areas.

HazLink Features: Zone 1 (Class I, Div 1)
(3) 3/4" NPT conduit outlets

HazLink Options: I/O Modules
Wiring Tees
Disconnect Switches

Item

HazLink Connectivity Enclosure

General Specifications

Enclosure: Die-cast aluminum; O-ring sealed

Coating: Dichromate conversion (inside); powder polyester coating (outside)

O-rings: Buna N

Cover: Screw cover with O-ring seal

Conduit Outlets: Three 3/4" NPT

Environment: NEMA Type 4, 4X, 7 and 9

Approvals: Explosion Proof
Zone 1
Class I, Div 1 & 2, Groups A,B,C,D
Class II, Div 1 & 2, Groups E,F,G

I/O Modules

HazLink I/O Modules allow users to cost-effectively connect new or existing conventional devices into the FOUNDATION Fieldbus network in Zone 1 (Class I, Div 1) hazardous areas.

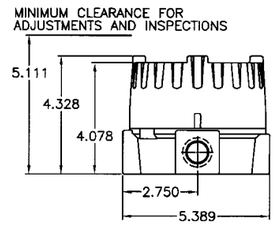
NHL-FFIO Hazlink Connectivity Enclosure with FOUNDATION Fieldbus I/O
2 input, 2 output knifegate valve or cylinder controller

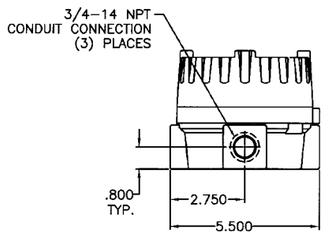
HazLink Connectivity Enclosures

TOPWORX

FOUNDATION Fieldbus

Dimensions



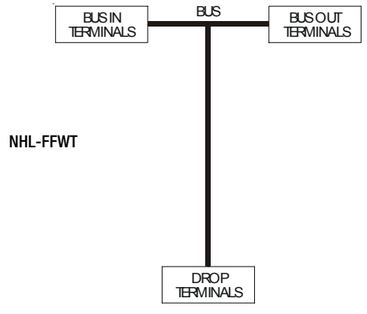


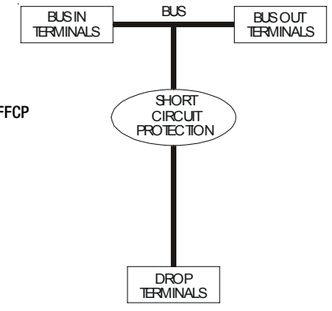
Wiring Tees

HazLink Wiring Tees make it easy to connect field devices to bus lines using wire terminals or plug-in connectors.

NHL-FFWT FOUNDATION Fieldbus tee with 3 x 3 position wiring terminals

NHL-FFCP Short circuit protection





Disconnect Switches

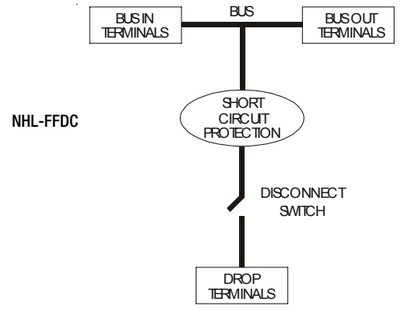
HazLink Disconnect Switches enable users to repair or replace a field device without disturbing the network with the simple flip of a lever-operated switch.

Disconnect Switches are designed to be locked if desired. Locking prevents tampering or accidental device connection or disconnection.

TopWorx offers Disconnect Switches in HazLink enclosures with or without short circuit protection.

NHL-FFDS Disconnect switch

NHL-FFDC Disconnect switch with short circuit protection



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Terminal Block Junctions & Accessories

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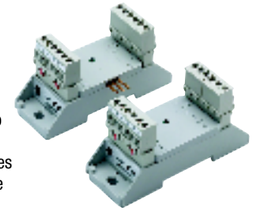
These products provide for the interconnection of a FOUNDATION Fieldbus network using standard wiring and DIN rail mountable terminal connections. The pluggable screw terminal connectors allow users to disconnect devices from the network without disconnecting individual wires.

General Specifications

Operating Temperature: -49° to 158°F (-45° to 70°C)

Item	Part Number & Description	
Megablocks These DIN rail mounted blocks provide a preassembled, fixed configuration for connection of 4 or 8 FOUNDATION Fieldbus devices. Additional blocks may be added for additional device connections. Integrated short circuit protection is available and will maintain network integrity in the event of a direct connection between two fieldbus conductors on an individual spur or drop cable.   Megablocks require terminator NFF-1A05.	**NFF-1A01**	4-drop block
	NFF-1A02	4-drop block with integrated short circuit protection [1]
	NFF-1A03	8-drop block
	NFF-1A04	8-drop block with integrated short circuit protection [1]
	NFF-1A05	Megablock terminator, 39V limit

[1] <60mA per spur; CSA approved Class I, Div 2, Groups A,B,C,D

Item	Part Number & Description	
Spur Blocks & Expanders Spur blocks provide for the connection of two trunk cable connections and two fieldbus device drop (spur) cables. Expanders are used to provide additional device connections to the spur. Each Expander block allows four additional drop cables for device connections. Multiple Expander blocks may be added as needed to expand the spur.  Additional Specifications **Surge Limit Start:** 39V **Approvals:** Class I, Div. 1, Groups A,B,C,D Short Circuit Protection - Terminators, page 61	Spur Blocks	
	NFF-1B11	Fieldbus Spur Block with pluggable screw terminal connectors [2]
	NFF-1B12	Fieldbus Spur Block with fixed screw terminal connectors
	NFF-1B13	Fieldbus Spur Block with cage clamp connectors
	Expanders	
	NFF-1B21	Fieldbus expander with pluggable screw terminal connectors [2]
	NFF-1B22	Fieldbus expander with fixed screw terminal connectors
	NFF-1B23	Fieldbus expander with cage clamp connectors

[2] SpurGuard compatible

Terminal Block Terminators & Protection

TOPWORX

Proper Power Conditioning and Short Circuit Protection are vital to any robust and successful FOUNDATION Fieldbus installation.

General Specifications

Operating Temperature: -40° to 158°F (-40° to 70°C)

Item	Part Number & Description			
Terminators FOUNDATION Fieldbus requires a terminator at each end of the main trunk line. Terminators reduce noise on the segments that is caused by signal reflections at the end of an open cable.  The grounded terminating blocks are used at the beginning of the trunkline in the system cabinet, while the isolated terminating blocks are used at the end of the trunkline in the field. Additional Specifications **Approvals:** Class I, Div. 1, Groups A,B,C,D **Surge Limit Start:** 39V (TI designation only)		Description	Connector Type	Surge Limit Start
	NFF-2A01 [1]	Isolated	Pluggable screw term.	39V
	NFF-2A02	Isolated	Fixed terminal	39V
	NFF-2A03	Isolated	Cage clamp	39V
	NFF-2A04 [1]	Grounded	Pluggable screw term.	-
	NFF-2A05	Grounded	Fixed terminal	-
	NFF-2A06	Grounded	Cage clamp	-

[1] SpurGuard compatible

Item	Part Number & Description	
Short Circuit Protection Short circuit protection will maintain network integrity in the event of a direct connection between the two fieldbus conductors on an individual spur or drop cable.  Additional Specifications **Approvals:** Class I, Div. 1, Groups A,B,C,D	**NFF-2B01**	Short circuit protection for nominal 20mA transmitter
	NFF-2B02	Short circuit protection for nominal 40mA transmitter

Short Circuit Current Limit		
	NFF-2B01	**NFF-2B02**
-40°C	60mA	91mA
20°C	52mA	78mA
50°C	47mA	71mA

The current limit decreases under prolonged short circuit conditions due to heating of the Spur Guards.

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Quick Disconnect Junctions & Accessories

502.969.8000

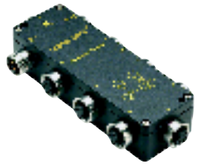
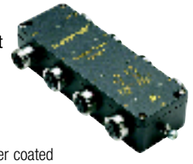
These junction blocks are used for the interconnection of a FOUNDATION Fieldbus segment when using quick disconnect style connectors.

Available with or without short-circuit protection.

- Terminators, page 64

General Specifications

Operating Temperature: -40° to 158°F (-40° to 70°C)
Protection Class: NEMA 1,3,4,12,13; IP67

Item	Part Number & Description
Passive Junctions  These junction blocks are used for the interconnection of a FOUNDATION Fieldbus segment when using quick disconnect style connectors. Additional Specifications **Housing:** Die-cast aluminum, black powder coated **Operating Current:** 9.0A (minifast); 4.0A (eurofast) **Operating Voltage:** 300V **No. of Pins:** 4	Minifast Passive Junctions **NFF-3A11** Minifast 8-port passive junction **NFF-3A12** Minifast 6-port passive junction **NFF-3A13** Minifast 4-port passive junction Eurofast Passive Junctions **NFF-3A21** Eurofast 8-port passive junction **NFF-3A22** Eurofast 6-port passive junction **NFF-3A23** Eurofast 4-port passive junction
Junctions with Short-Circuit Protection  These junction blocks are used for the interconnection of a FOUNDATION Fieldbus segment when using minifast connectors and allow for short circuit protection. Additional Specifications **Housing:** Die-cast aluminum, black powder coated **Voltage Surge Protection:** >36VDC **Output Current Limit:** 35mA per spur **No. of Pins:** 4	**NFF-3B01** 8-port junction with short-circuit protection **NFF-3B02** 6-port junction with short-circuit protection **NFF-3B03** 4-port junction with short-circuit protection
Junction Tees with Short-Circuit Protection  These minifast junction tees provide short circuit protection to 4 or 6 spurs in an overmold design that provides exceptional corrosion resistance. Additional Specifications **Housing:** Black polyurethane **Voltage Surge Protection:** >36VDC **Output Current Limit:** 55mA per spur **No. of Pins:** 4	**NFF-3C01** 6-port junction with short-circuit protection **NFF-3C02** 4-port junction with short-circuit protection

Tees & Terminators

TOPWORX

Tees and terminators are designed for use with Quick Disconnect connectors on page 68.

General Specifications

Protection Class: IP67

Item	Part Number & Description
System Tees   Tees provide for the addition of one drop cable to the trunkline using quick disconnect style or screw terminal connectors. For use with 490 or 491 FOUNDATION Fieldbus Cable. Additional Specifications **Operating Temperature:** -40° to 158°F (-40° to 70°C) **Protection Class:** NEMA 1,3,4,12,13	Die-cast Aluminum Enclosure **NFF-4A11** Tee with ground lug **NFF-4A12** Tee with terminal strip bus connectors Plastic Enclosure **NFF-4A21** Tee with ground lug **NFF-4A22** Tee with terminal strip bus connectors
FOUNDATION Fieldbus Tee  Tees provide for the addition of one drop cable to the trunkline using quick disconnect style connectors. For use with 490 or 491 FOUNDATION Fieldbus Cable. Additional Specifications **Operating Temperature:** -40° to 170°F (-40° to 80°C) **Connector:** Molded polyurethane construction **Protection Class:** NEMA 1,3,4,6,13 **Rating:** 9A, 600V (minifast); 4A, 300V (eurofast) **No. of Pins:** 4	**NFF-4B01** Minifast spur bus line Fieldbus tee **NFF-4B02** Eurofast spur bus line Fieldbus tee

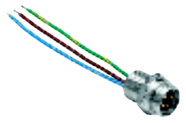
Tees & Terminators

502.969.8000

Tees and terminators are designed for use with Quick Disconnect (QDC) connectors on page 68.

General Specifications

Protection Class: IP67

Item	Part Number & Description	
Terminator Resistor Terminator Resistors with minifast and eurofast connectors.  Additional Specifications **Operating Temperature:** -40° to 170°F (-40° to 80°C) **Connector:** Oil resistant grey polyurethane body material and contact carrier, 300V rating **Coupling Nuts:** Stainless steel **Protection:** NEMA 1,3,4,6p **No. of Pins:** 4	**NFF-4C01**	Minifast terminator resistor with male minifast connector
	NFF-4C02	Eurofast terminator resistor with male eurofast connector
Device Gland Receptacle and Bulkhead Fittings The device gland receptacle provides wiring to the terminals inside a FOUNDATION Fieldbus device and an external receptacle for a QDC drop cable connection.  Bulkhead fittings provide QDC connection for inside and outside an electrical housing. Additional Specifications **Operating Temperature:** -40° to 221°F (-40° to 105°C) **Contact Carrier:** Polyurethane (minifast); Nylon (eurofast) **Protection:** NEMA 1,3,4,6 **No. of Pins:** 4	**NFF-4D01**	Minifast device gland receptacle, 4.5 in, 9A, 600V
	NFF-4D02	Eurofast device gland receptacle, 4.5 in, 4A, 300V
	NFF-4D03	Minifast bulkhead fitting, 9A, 600V
	NFF-4D04	Eurofast bulkhead fitting, 4A, 250V

Terminal Block Repeaters

TOPWORX

Repeaters provide a means of maintaining signal quality over long distance cable runs or powering multiple I.S. segments on the same FF segment.

While I.S. segments can support a limited number of devices, a typical FF segment may contain 16 or 32 devices per segment. Multiple I.S. segments can be interconnected on the same FF segment.

General Specifications

Operating Temperature: -4° to 140°F (-20° to 60°C)
Power Supply Nominal Voltage: 20-35VDC

FOUNDATION Fieldbus

Item	Part Number & Description	
Fieldbus Repeaters & Power Supply  NFF-5A11 and NFF-5A12 contain integrated I.S. barriers for repeated I.S. segment installations. Intrinsically safe repeaters are approved for Class I, Div 1, Groups A-D. Quick Connect - Terminators, page 64	For Intrinsically Safe Applications	
	NFF-5A11	I.S. Fieldbus Repeater with 70mA output current
	NFF-5A12	I.S Fieldbus Repeater acc. to FISCO with 100mA output current
	For Standard Applications	
	NFF-5A21	Fieldbus Repeater with 400mA output current
	NFF-5A22	Fieldbus Power Supply with 400mA output current

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Terminal Block Power Conditioners

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Fieldbus Power Conditioning provides a means of connecting a conventional power source to a FOUNDATION Fieldbus segment. Power Conditioning is required to maintain proper segment voltage and isolate FF communications. These power conditioners are stand-alone, DIN rail mountable, and can be used for any FF segment wiring style.

Power conditioners require a 24V power supply. See our selection of power supplies on page 116.

Item	Part Number & Description
Power Conditioners	
	**NFF-6A01** Isolater/Power supply (I.S.) 80mA output current (max.)
	**NFF-6A02** Fieldbus power supply 350mA output current (max.) Switch selectable internal FF terminator
	NFF-6A03 Shunt-diode safety barrier for use with MTL-5995 100mA output current (max.)
	NFF-6A04 [1] Redundant Fieldbus Power System 350mA output current (max.) Contains an internal FF terminator

The NFF-6A01 model provides an integrated I.S. barrier and connections for hazardous area installations as well non-I.S. safe area connections.

The NFF-6A02 has no integrated I.S. barrier functionality and requires use of the 791 for any hazardous area device connections.

The NFF-6A04 provides redundant power conditioning for an FF segment and can be supplied by redundant 24VDC power supplies.

Specifications

Operating Temperature: -6° to 140°F (-20° to 60°C)

[1] **Operating Temperature:** -40° to 149°F (-40° to 65°C)

Terminal Block Power Conditioners & Multiplexers

TOPWORX

Fieldbus Power Conditioning provides a means of connecting a conventional power source to a FOUNDATION Fieldbus segment. Power Conditioning is required to maintain proper segment voltage and isolate FF communications.

General Specifications

Operating Temperature: -40° to 158°F (-40° to 70°C)

FOUNDATION Fieldbus

Power Conditioners

These power conditioners are available with screw terminal, fixed terminal, or cage clamp connectors and are typically used with the Terminal Block Junctions and Accessories on page 60.

Additional Specifications

Surge Limit Start: 39V (Conditioners)

Output Current: 330mA min. (Conditioners)
2.5A max. (Multiplexer)

Item	No. of Terminators	Connector Type	Part Number & Description
NFF-6B01	-	Pluggable screw terminal	
NFF-6B02	-	Fixed terminal	
NFF-6B03	-	Cage clamp	
NFF-6B04	1	Pluggable screw terminal	
NFF-6B05	1	Fixed terminal	
NFF-6B06	1	Cage clamp	
NFF-6B07	2	Pluggable screw terminal	
NFF-6B08	2	Fixed terminal	
NFF-6B09	2	Cage clamp	

Power Multiplexer

The fieldbus power multiplexer provides uninterrupted power to the fieldbus segments and are available with screw terminal, fixed terminal, or cage clamp connectors and are typically used with the Terminal Block Junctions and Accessories on page 60.

Additional Specifications

Surge Limit Start: 39V (Conditioners)

Output Current: 330mA min. (Conditioners)
2.5A max. (Multiplexer)

Item	Part Number & Description
NFF-6C01	Power multiplexer, fixed terminal connectors
NFF-6C02	Power multiplexer, cage clamp connectors

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Field Wirable Connectors

502.969.8000

These plug style connectors are designed for easy installation in the field after the FOUNDATION Fieldbus wiring has been routed through the conduit, wire-ways, panel enclosures, and other locations. Available in minifast or eurofast.

General Specifications

Operating Temperature: -40° to 185°F (-40° to 85°C)
Protection Class: IP67

Item	Part Number & Description	
Minifast Connectors		
Additional Specifications **Housing:** Nylon, type PA 6.6 GV **Connector Insert:** Polyurethane; V2 acc. UL 94 **Contact Materials:** CuZn plated copper alloy **Coupling Nuts:** Anodized aluminum **Protection:** NEMA 1, 3, 4, 6 & 13	**NFC-MFS**	Minifast field wirable straight female connector
	NFC-MMS	Minifast field wirable straight male connector
Eurofast Connectors		
Additional Specifications **Housing:** Polyester, PBT Black **Connector Insert:** PBT; spacings to VDE 0110 Group C **Contact Materials:** Nickel plated copper alloy **Coupling Nuts:** Female - PBT; Male - Nickel Plated Brass **Protection:** NEMA 1, 3, 4 & 6p	Female Connectors	
	NFC-EFS	Eurofast field wirable straight female connector
	NFC-EFR	Eurofast field wirable right angle female connector
	Male Connectors	
	NFC-EMS	Eurofast field wirable straight male connector
	NFC-EMR	Eurofast field wirable right angle male connector

Molded Connector Cordsets

TOPWORX

These cordsets provide FOUNDATION Fieldbus cable with pre-installed, plug-in connectors, reducing installation time in the field.

Available in 1, 3, 5, and 10 meter lengths. Consult the factory for additional cordset lengths.

Item	Part Number & Description	
Molded Connector Cordsets		
	**To create your cordset part number:** 1) Select your connector types 2) Select your cable type from the list below (* = cable type) 3) Select your cordset length from the chart below (☐ = cordset length) *Example* *NFF-DEC1 = PVC yellow FF 3-wire double eurofast connector cordset, 1 m*	
TopWorx offers FOUNDATION Fieldbus molded connector cordsets in PVC fieldbus yellow 3-wire cable and 3-wire armor cable. Cordsets are available with a molded connector on each end or with one end bare to facilitate routing of cable through conduit or panel enclosures. All double cordsets have one straight male connector and one straight female connector. See page 70 for cable specifications.	Double Connector Cordsets	
	Eurofast Connectors	**NFF-DE*-☐**
	Minifast Connectors	**NFF-DM*-☐**
	Single Connector Cordsets	
	Eurofast Connector	**NFF-EM*-☐** Male eurofast connector
		NFF-EF*-☐ Female eurofast connector
	Minifast Connector	**NFF-MM*-☐** Male minifast connector
		NFF-MF*-☐ Female minifast connector
Connector Specifications **Plug Body:** Molded polyurethane **Contacts:** Gold plated brass **Coupling Nuts:** Stainless steel **Temperature:** -40° to 158°F (-40° to 70°C) **Protection:** NEMA 1,3,4,6,13; IP67 **Rated Current:** 9.0A (minifast); 4.0A (eurofast)		

*** Cable Types**

FC1 = PVC yellow Fieldbus 3-wire cable

FC2 = PVC yellow Fieldbus 3-wire armor cable

☐ Cordset Length

Part Number ☐	Cordset Length
1	1 m
3	3 m
5	5 m
10	10 m

Consult factory for additional cordset lengths.

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FOUNDATION Fieldbus Bulk Cable

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Cable that meets the requirements of ISA/SP50 and the FOUNDATION Fieldbus requirements for Type A cable.

Cable is sunlight resistant and rated from -40° to 221°F (-40° to 105°C).

Available in 30, 75, and 150 meter spools. Consult the factory for additional cable lengths.

Chart Legend - Field wirable connectors, page 68

Item	Part Number & Description
FOUNDATION Fieldbus Bulk Cable Additional Specifications **Type of Drain Wire:** Foil **Connector Insert:** Polyurethane; V2 acc. UL 94 **Contact Materials**: CuZn plated copper alloy **Coupling Nuts:** Stainless steel **Rating:** 300V **Protection:** NEMA 1,3,4,6,13	**To create your bulk cable part number, use the chart below to select the appropriate cable length for your application, where ☐ = cable length.** *Example* *NFF-FC1-030 = PVC yellow FF 3-wire cable in 30 meter spool* Bulk Cable Types **NFF-FC1-☐** PVC yellow FOUNDATION Fieldbus 3-wire cable **NFF-FC2-☐** PVC yellow FOUNDATION Fieldbus 3-wire armor cable

Part Number ☐	Cable Length
030	30 m
075	75 m
150	150 m

Consult factory for additional cable lengths.

Diagnostic Tools

TOPWORX

Our selection of diagnostic tools are is designed to reduce the total cost of ownership of FOUNDATION Fieldbus networks and devices.

These devices provide powerful FOUNDATION Fieldbus troubleshooting tools in a convenient handheld unit.

General Specifications

Operating Temperature: 32° to 122°F (0° to 50°C)

Item	Part Number & Description
Fieldbus Monitor The Monitor provides diagnostics on live Fieldbus segments and tests ten vital segment parameters, including Voltage, Communications Signal Levels, Noise, and LAS device presence. Draws approximately 10mA of current from the Fieldbus network. 	**NFF-DT3** Fieldbus Monitor
Fieldbus Power & Signal Probe The Power & Signal Probe is a simple tool that uses individual LEDs to indicate bus power and signal levels on individual points on a Fieldbus network segment. Draws 12-15mA of current from the Fieldbus network. 	**NFF-DT4** Fieldbus Power & Signal Probe
Fieldbus Wiring Validator The Validator is used to inject DC power and to test communication signal on newly installed FF wiring. It may be used with the Monitor to completely test new or existing wiring segments. The Validator must not be used in hazardous areas or to power wiring that runs into hazardous areas.  Also provides power for calibration of TopWorx DVC-FF and DVM-FF.	**NFF-DT5** Fieldbus Wiring Validator

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DeviceNet Overview

DeviceNet is a CAN based Layer 7 protocol originally developed by Allen-Bradley. Operation of the DeviceNet is based on an object-oriented communications model. DeviceNet is maintained by the Open DeviceNet Vendor Association (ODVA).

DeviceNet is designed to connect simple devices from multiple vendors that comply with the DeviceNet network standards. DeviceNet device profile standards provide interchangeability between device manufacturers.

Each DeviceNet segment can connect up to 64 devices. It is a four-wire system delivering 8 amps at 24VDC, sufficient for field devices such as solenoid valves. The four wires carry signal and power typically on a single cable. Multiple power supplies can be used for redundancy and additional power requirements.

DeviceNet uses a trunk (bus) line with drop cables connecting devices. The trunkline requires 121 ohm terminating resistors at each end of the trunk.

DeviceNet supports Master/Slave, Peer-to-Peer, and Multi-Master network models. Data can be transferred on a cyclic or change of state basis using a Producer/Consumer paradigm that conserves network bandwidth. DeviceNet is very commonly used for communications from host systems to motor control centers and variable speed drives.

DeviceNet Network Highlights

Type of Network Device Bus

Physical Media Two Shielded twisted pairs in one shielded thick, thin or flat cable (one pair for signal, one pair for power)

Network Topology Bus with drops

Maximum Devices 62 devices per segment

Maximum Distance (using Thick cable)
Maximum Distance with repeaters 6,000 meters
125Kbps
- 500m (1640 ft)
- 6m (20 ft) individual drop cable length
- 156m (512 ft) cumulative drop cable length

250Kbps
- 250m (820 ft)
- 6m (20 ft) individual drop cable length
- 78m (256 ft) cumulative drop cable length

500K bps
- 100m (328 ft)
- 6m (20 ft) individual drop cable length
- 39m (128 ft) cumulative drop cable length

* Thin cable may be used as trunk. Maximum distance is 100 meters, regardless of data rate

Communication Methods Master/slave, multiple master, peer-to-peer, change of state or cyclic (uses Producer/Consumer Paradigm)

Primary usage
Motor Control Centers, Variable Speed Drives, Remote I/O applications

Power and Communications on same cable
24VDC power on power bus (multiple supplies may be used for additional power or as backup). A separate 24VDC power supply for communication bus is recommended.

Device Power Supply 24VDC on power bus

Wiring Types
Thick Cable (ODVA Type II cable), generally used for trunk cable

Thin Cable (ODVA Type I cable), commonly used for drop cables

Mid Cable (ODVA Type III cable), used when more flexible drop cable is needed

Blue/White conductors for communications
Red/Black conductors for power

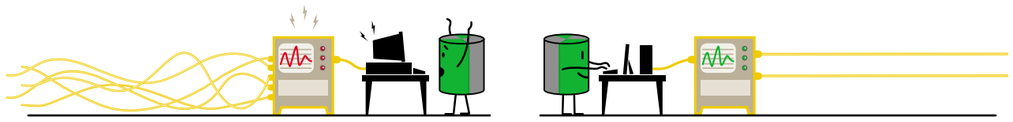
Grounding aspects
Ground only the power supply closest to the middle of the network

Terminators
121 ohm terminator at each trunk line end

Web Site **www.odva.org**

Conventional I/O System vs. DeviceNet Network

DeviceNet is feature-rich, yet cost effective.



CONVENTIONAL I/O SYSTEM

Advantages
- Technology is already understood
- Lower device cost
- Independent wiring from devices to the control system means wiring problems with one device don't affect other field devices

Drawbacks
- Higher installed cost
- Point-to-point wiring is expensive
- Many wiring connections:
  - are labor intensive to install
  - create many points of failure
  - increase complexity when troubleshooting
  - require large amounts of cabinet or rack space for installation of terminal blocks
  - create time-consuming initial checkout and startup
- Expansion requires duplicating the entire wiring scheme for each additional point

DeviceNet is most commonly used when device populations are primarily discrete but have some analog, and when motor control centers and variable frequency drives are present.

DEVICENET NETWORK

Advantages
- Excellent support for motor control centers, variable frequency drives, and conventional I/O
- Moderate device cost adder
- Lower installed cost
- I/O modules allow for conventional analog and discrete device integration
- Relatively fast transmission speeds:
  - Transmission Speed and cable lengths:
    - 125kb @ 420m
    - 250kb @ 200m
    - 500kb @ 100m
- Power and Signal on same cable
- Up to 64 addressable nodes
- Wide variety of topologies available, including Trunk, Line, Drop
- Duplicate node address detection
- Supports some device diagnostics

Drawbacks
- Slaves can only be owned by one master
- Does not support Intrinsically Safe installations

TopWorx Comments on DeviceNet

Strengths
DeviceNet is capable. DeviceNet delivers a solid combination of cost-effective simplicity with a bit of added functionality. It is designed to handle discrete devices but can support analog signals and some diagnostics as well.

DeviceNet is robust. DeviceNet supplies 8 amps of power, offers acceptable cable run lengths, and can control up to 64 devices per segment.

Limitations
Hazardous Areas
Since DeviceNet is an 8 amp bus, it cannot be intrinsically safe. TopWorx has created a variety of solutions for installing DeviceNet in Class I, Div 1 (Zone 1) and Class I, Div 2 (Zone 2) hazardous environments.

Cost When Simplicity is Needed
If customers have only discrete devices and need no added functionality, then some other protocols are less expensive.

When to Use DeviceNet
Generally speaking, TopWorx recommends DeviceNet when:
- device populations are primarily discrete and secondarily analog
- end users desire some diagnostic capability for predictive environments
- plants are not intrinsically safe

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Device Bus Network

DeviceNet Sensor-Communications Module

DeviceNet™

The TopWorx Sensor-Communications Module (SCM) combines position sensors, DeviceNet communication, solenoid outputs, and wiring terminals into a compact enclosure that is potted and sealed from the environment.

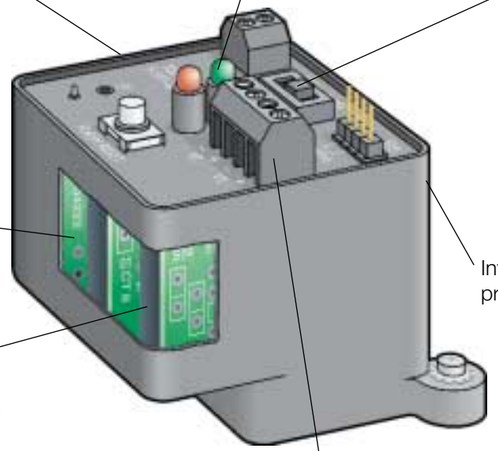
SCM-DN enclosure is **resistant to high levels of impact, moisture, shock, and vibration.**

Britelite LEDs indicate valve position and facilitate sensor set up.

Calibration Switch facilitates initial setup. The three position On-Off-DN switch enables the valve to be test cycled open and closed offline, then put onto the network when ready.

All electronics are **short-circuit protected,** eliminating the expense of adding separate short-circuit protection.

Integrated position sensors provide valve position feedback.



All micro-processor based electronics are completely **potted and sealed,** preventing premature failure due to moisture or contamination.

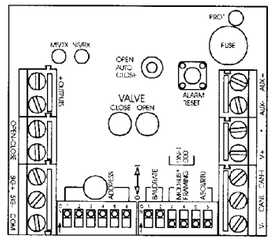
Onboard terminals provide connection points for **auxiliary discrete and analog inputs.**

SCM-DN Highlights

The Sensor-Communications Module delivers valve position feedback, communicates directly on the DeviceNet network, pilots the valve actuator, and provides extra wiring terminals for auxiliary inputs.

The TopWorx SCM-DN is a compact, sealed module that can be used in a variety of enclosures suitable for use in any hazardous or corrosive process environment.

3 Discrete Inputs (DI)	Open/Closed valve position feedback and 1 Auxiliary Input for dry contact
2 Discrete Outputs (DO)	Solenoid outputs for single or double acting
1 Analog Input (AI)	Optional 4-20mA input
Calibration Switch	Open-Close-DeviceNet
Status/Warning LEDs	Open, Closed, Alarm State
ODVA Conformance Tested	Yes
Short Circuit Protection	Yes
Maximum Output Current	500mA per output
Maximum Output Power	12 watts per output
Voltage	11-30 VDC
Diagnostics	
Cycle Counter	Records number of cycles
Cycle Time Alarms	User settable values for Open & Close cycle times
Visual Alarm Indication	Blinking LEDs
Auto Baud Rate Detection	125kb, 250kb, 500kb



SCM-DN Wiring Diagram

The DeviceNet Sensor-Communications Module fits conveniently into a variety of valve control enclosures suitable for any process environment.

Lumitech DVC-DN

Discrete Valve Controller
- Zone 2 (Class I, Div 2)
- Integral Solenoid Valve
- Direct Mount

See page 130 for more details.

Lumitech DVM-DN

Discrete Valve Monitor
- Zone 2 (Class I, Div 2)
- Direct Mount

See page 132 for more details.

Did You Know?

TopWorx is an official member of Rockwell Automation's "Encompass" program, a third-party product referencing program for qualified suppliers that complement Rockwell Automation's solutions offering.

Switchpak DXP-DN
Switchpak DXS-DN (Stainless Steel enclosure)

Discrete Valve Monitor
- Zone 1 (Class I, Div 1)

See page 134, 136 for more details.

HazLink Connectivity Enclosures

502.969.8000

DeviceNet™ The DeviceNet device bus network was originally designed to be used for factory automation rather than process automation. Therefore, in the process industries there has been a need for easy, cost-effective ways to make wiring connections in hazardous areas.

Our HazLink products are rugged junction enclosures that provide flexible wiring options in hazardous areas, making DeviceNet more suitable for use in the process industries.

HazLink Features: Zone 1 (Class I, Div 1)
(3) 3/4" NPT conduit outlets

HazLink Options: I/O Modules
Wiring Tees
Disconnect Switches

Item

HazLink Connectivity Enclosure

General Specifications

Enclosure: Die-cast aluminum; O-ring sealed

Coating: Dichromate conversion (inside); powder polyester coating (outside)

O-rings: Buna N

Cover: Screw cover with O-ring seal

Conduit Outlets: Three 3/4" NPT

Environment: NEMA Type 4, 4X, 7 and 9

Approvals: Explosion Proof
Zone 1
Class I, Div 1 & 2, Groups A,B,C,D
Class II, Div 1 & 2, Groups E,F,G

c UL us LISTED CE

I/O Modules

HazLink I/O Modules allow users to cost-effectively connect new or existing conventional devices into the DeviceNet network in Zone 1 (Class I, Div 1) hazardous areas.

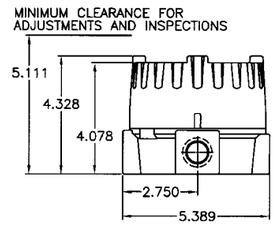
NHL-DNIO Hazlink Connectivity Enclosure with DeviceNet I/O
2 input, 2 output knifegate valve or cylinder controller

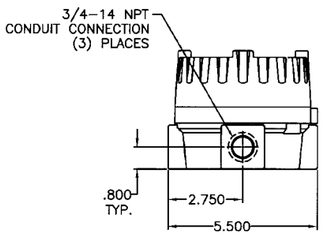
HazLink Connectivity Enclosures

TOPWORX

DeviceNet™

Dimensions





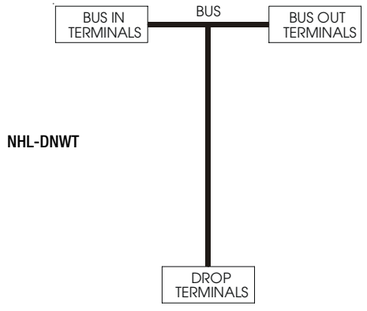
DeviceNet

Wiring Tees

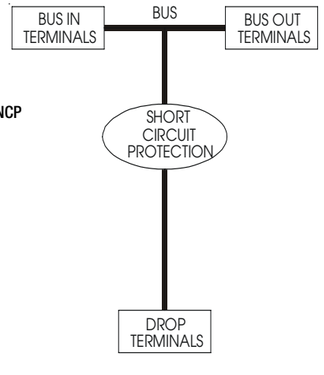
HazLink Wiring Tees make it easy to connect field devices to bus lines using wire terminals or plug-in connectors.

NHL-DNWT DeviceNet tee with 3 x 5 position wiring terminals

NHL-DNCP Short circuit protection



NHL-DNWT



NHL-DNCP

Disconnect Switches

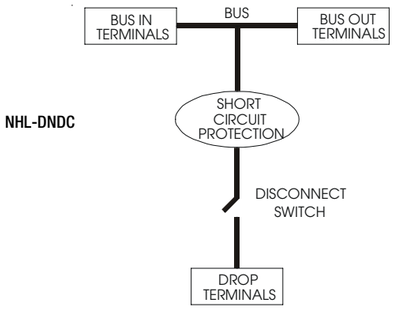
HazLink Disconnect Switches enable users to repair or replace a field device without disturbing the network with the simple flip of a lever-operated switch.

Disconnect Switches are designed to be locked if desired. Locking prevents tampering or accidental device connection or disconnection.

TopWorx offers Disconnect Switches in HazLink enclosures with or without short circuit protection.

NHL-DNDS Disconnect switch

NHL-DNDC Disconnect switch with short circuit protection



NHL-DNDC

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AS-i to DeviceNet Gateways

502.969.8000

DeviceNet AS-i to DeviceNet Gateways provide a means of easily connecting an AS-i network to a higher level DeviceNet network. The Gateway is recognized as a single node on the higher level DeviceNet network while controlling the field devices on the AS-Interface network.

General Specifications

Operating Temperature: 32° to 131°F (0° to 55°C)
Mounting: DIN rail
Voltage of insulation: ≥ 500V
Protection Category: Housing IP40, Terminals IP20

Item

AS-i to DeviceNet Gateways

Gateway

Gateway with graphical display

Functions as a master on the AS-i network and as a single node on the DeviceNet network.

These devices include demonstration software that performs addressing, monitoring, and diagnostics of the network.

Additional Specifications

Single Gateways

Operating Voltage: 30VDC AS-i voltage

Operating Current: 200mA (from AS-i circuit)

Dual Gateways

Operating Voltage: 24VDC

Operating Current: 200mA (from AS-i 1), 70mA (from AS-i 2)

Check it out!
- D-sub-data transmission cords, page 117
- Master simulators for testing, below

DeviceNet Master Simulator

This device connects to a parallel port on a PC and allows direct connection to a DeviceNet segment. This is useful when scanning the segment for devices and monitoring low level attributes of slave devices.

General Specifications

Operating Temperature: 32° to 131°F (0° to 55°C)
Power Supply: Powered by the keyboard interface of the PC
Transfer Rate: 125, 250 or 500 KBaud
Interfaces: CAN interface with 9-pin D-sub-plug
Length of Connector Cable: max. 2 m

Part Number & Description

	Graphical Display	# AS-i Masters	AS-i Specification
NAS-GD01	Yes	Single	2.1
NAS-GD02	Yes	Dual	2.1
NAS-GD03	No	Single	2.0

NDN-1A01 DeviceNet Master Simulator

Modbus to DeviceNet Gateway

TOPWORX

DeviceNet

DeviceNet The Modbus to DeviceNet Gateway allows the connection of slave devices to a DeviceNet network. The gateway becomes a single node on the DeviceNet network.

General Specifications

Baud Rate Selection: Auto/125k/250k/500k baud
Address Selection: Switch selectable 0-63

Item

Modbus to DeviceNet Gateway

The Modbus to DeviceNet allows the connection of Modbus capable slave devices to a DeviceNet network.

The DeviceNet address is set using DIP switches on the device and the DeviceNet baud rate is automatically determined when connected to the network. A single gateway is capable of communicating with one or more Modbus devices.

Additional Specifications

Operating Temperature: 32° to 140°F (0° to 60°C)
Maximum Power: 200mA/11VDC to 90mA/25VDC

Part Number & Description

NDN-1A02 Modbus to DeviceNet gateway, RS 232 interface

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Terminal Block Discrete I/O

502.969.8000

DeviceNet™ Terminal Block Discrete Input/Output adaptors and modules provide a means of easily integrating conventional discrete devices into the DeviceNet network.

Item	Part Number & Description

Discrete I/O Adapters

I/O adaptors are DIN rail mountable and accept the Discrete I/O modules listed below.

Select your I/O modules to customize the adaptors for your applications.

Terminals are provided for 24VDC external power source connection for powering field I/O devices (max 10A).

General Specifications

Operating Temperature: 32° to 158°F (0° to 70°C)

Maximum Power: 200mA/11VDC to 90mA/25VDC

Discrete Inputs/Outputs

NDN-2A01 Adapter with 4 discrete inputs/outputs

NDN-2A02 Adapter with 8 discrete inputs/outputs

Discrete I/O Modules

Discrete I/O modules are designed for use with I/O adaptors above.

Select I/O modules to match your requirements.

General Specifications

Isolation: 4000 V rms

Operating Temperature: -22° to 176°F (-30° to 80°C)

Maximum Current: 50mA DC (Input Modules)

Maximum On-State Current: 3A continuous (Output Modules)

Maximum 1 cycle surge: 100A peak

Input Modules

NDN-2B11 AC input, 120V

NDN-2B12 DC input, 24V

NDN-2B13 AC input, 240V

Output Modules

NDN-2B21 AC output, 120V

NDN-2B22 DC output, 60V

NDN-2B23 DC output, 220VAC

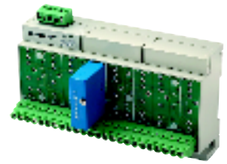
Terminal Block Analog I/O

TOPWORX

DeviceNet™ Terminal Block Analog Input/Output adaptors and modules provide a means of easily integrating conventional analog devices into the DeviceNet network.

Item	Part Number & Description

Analog I/O Adapters



I/O adaptors are DIN rail mountable and accept the Analog I/O modules listed below.

Select your I/O modules to customize the adaptors for your applications.

General Specifications

Operating Temperature: 32° to 158°F (0° to 70°C)

Maximum Power:

NDN-3A01 8 watts: 730mA/11VDC to 320mA/25VDC

NDN-3A02 15 watts: 1.4A/11VDC to 600mA/25VDC

NDN-3A01 Adapter with 4 analog inputs

NDN-3A02 Adapter with 8 analog inputs

Analog Signal Conditioning

Analog I/O modules are designed for use with I/O adaptors above.

Select I/O modules to match your requirements.

General Specifications

Isolation: 60V channel to channel; 1500V channel to network

Accuracy: ± 0.02% of span

mA Input Module (for externally powered field transmitters)

NDN-3B11 4-20mA input

NDN-3B12 0-20mA input

mA Output Module

NDN-3B21 4-20mA output

NDN-3B22 0-20mA output

Voltage Input Module

NDN-3B31 0-10V input

NDN-3B32 0-5V input

RTD Input Module (for 2 or 3 wire Pt RTDs)

NDN-3B41 -100° to 100°C Pt input

NDN-3B42 0° to 200°C Pt input

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DeviceNet DeviceNet Modular I/O is DIN rail mountable and recommended for high density, low-cost applications. The modular I/O system is connected to the DeviceNet segment via the fieldbus coupler. Input/Output Modules can contain a mixture of analog, discrete, and speciality modules to meet your specific application requirements.

General Specifications

Operating Temperature: 32° to 131°F (0° to 55°C)
Protection Class: IP20
Connection: Cage clamp wiring connections

Item	Part Number & Description
DeviceNet I/O Coupler The fieldbus coupler interfaces the I/O system to the DeviceNet network and may contain any assortment of discrete, analog and speciality modules listed below. The fieldbus coupler supports a maximum 512 byte input image and a maximum 512 byte output image. Terminals are provided for 24VDC external power source connection for powering field I/O devices (max 10A).	**NDN-4A01** DeviceNet fieldbus coupler, 125-500 KBaud
Discrete I/O Modules These Discrete I/O modules are designed for use with the coupling module above to provide a means of integrating conventional discrete I/O into a DeviceNet network. Discrete signals are transferred by the bus coupler bit by bit. When digital information exceeds 8 bits, a new byte is automatically started. Additional Specifications **Approvals:** Class 1, Div 2 (except Relay Output Modules)	Inputs **NMI-DN01** 4-channel digital input, 24VDC, 3.0 ms input filter **NMI-DN02** 2-channel digital input, 120VAC Outputs **NMI-DT01** 4-channel digital output with diagnostics, 24VDC 0.5A output current **NMI-DT02** 2-channel digital output with diagnostics, 24VDC 2.0A output current Relay Outputs **NMI-DR01** 2-channel relay output, non-floating, 2 SPST contacts Switching voltage: 250V AC/30VDC Switching current: 2.0A AC/DC **NMI-DR02** 2-channel relay output, 2 SPST contacts Switching voltage: 250VAC/30VDC Switching current: 2.0A AC/DC **NMI-DR03** 2-channel relay output, 2 SPDT contacts Switching voltage: 125VAC/30VDC Switching current: 0.5A AC/1.0A DC

DeviceNet

Item	Part Number & Description
DIN Analog I/O Modules These Analog I/O modules are designed for use with the Fieldbus Coupling module to provide a means of integrating conventional analog devices into a Profibus network. Analog signals are transferred via bytes or words. Additional Specifications **Approvals:** Class 1, Div 2 (except Thermocouple modules)	Inputs **NMI-AN01** 2-channel analog input, RTD, PT100 sensor type **NMI-AN02** 2-channel analog input, 0-10VDC, single ended **NMI-AN03** 4-channel analog input, 0-10VDC, single ended **NMI-AN04** 2-channel analog input, type K thermocouple (-148° to 2498°F) **NMI-AN05** 2-channel analog input, type J thermocouple (-148° to 2192°F) **NMI-AN06** 2-channel analog input, 0-20mA, Overload protection, 16Bit **NMI-AN07** 2-channel, 4-20 mA, Overload protection, 16Bit Outputs **NMI-AT01** 2-channel analog output, 0-10VDC **NMI-AT02** 2-channel analog output, 0-20mA **NMI-AT03** 2-channel analog output, 4-20mA
Power Supply Modules These modules can be added to distribute power to field devices via the I/O system. Power is supplied from an external source. See our Power Supply section when 24VDC is required.	**NMI-PS01** 24VDC, 2A power supply **NMI-PS02** 24VDC, max. 6.3A with diagnostics and fuse-holder **NMI-PS03** 230VAC, max. 6.3A with diagnostics and fuse-holder **NMI-PS04** 120VAC, max. 6.3A with fuse-holder, no diagnostics
Separation & End Modules A separation module provides a visual and an electrical separation between field I/O power types (i.e. 24VDC from 120VAC modules). One end module is required at the physical end of each I/O System, with one per Bus Coupler.	**NMI-SM01** Separation module **NMI-EM01** End module

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Quick Disconnect I/O Modules

502.969.8000

DeviceNet™ Quick Disconnect Input/Output Modules provide a method of connecting conventional field devices to a DeviceNet Network with quick-disconnect (QDC) style connectors in a rugged, field mountable unit.

General Specifications

Housing Material: Glass filled nylon with nickel plated brass connectors
Operating Temperature: -13° to 158°F (-25° to 70°C)
Protection Class: NEMA 1,3,4,12,13; IP67

Item	Part Number & Description	Inputs	Outputs	Max. Output Load
I/O Modules with Advanced Diagnostics With Per Point Diagnostics **Additional Specifications** **Combatibility**: NPN/PNP **Open-circuit Detection**: Individual **Short-circuit Protection**: Individual **Baud Rate Selection:** Auto/125k/250k/500k baud **Address Selection:** Switch selectable 0-63 **No. of Pins:** 5	**NDN-5A01**	8	-	-
	NDN-5A02	16	-	-
	NDN-5A03	4	4	0.5A
	NDN-5A04	8	8	0.5A
	NDN-5A05	8	8	2.0A

Item	Part Number & Description	Inputs	Outputs	Max. Output Load
I/O Modules with Standard Diagnostics With Group Diagnostics **Additional Specifications** **Combatibility**: PNP sensors **Open-circuit Detection**: Individual **Short-circuit Protection**: Group **Baud Rate Selection:** Auto/125k/250k/500k baud **Address Selection:** Switch selectable 0-63 **No. of Pins:** 5	**NDN-5B01**	8	8	0.5A
	NDN-5B02	4	4	0.5A
	NDN-5B03	8	8	0.5A
	NDN-5B04	16	16	0.5A
	NDN-5B05	-	8	0.5A
	NDN-5B06	-	8	1.4A

Quick Disconnect Junctions & Accessories

TOPWORX

DeviceNet

DeviceNet™ Junction modules and Junction tees are used to easily construct the physical layer of a DeviceNet network.

These modules provide QDC connections for the trunkline, drop lines, and individual host devices.

General Specifications

Protection Class: IP67

Item	Part Number & Description	
Eurofast Junction Modules **Additional Specifications** **Housing**: Nylon 6, 30% glass reinforced **Connectors**: Nickel-plated brass **Operating Voltage**: 300V **Operating Current per Conductor**: 9.0A (minifast), 4.0A (eurofast) **Operating Temperature**: -13° to 158°F (-25° to 70°C) **Protection**: NEMA 1,3,4,12,13 **No. of Pins:** 5	**NDN-6A01**	8 ports, eurofast, with minifast trunk connectors, voltage monitoring with low and high voltage LED indication
	NDN-6A02	8 ports, eurofast, with minifast trunk connectors

Item	Part Number & Description	
Junction Tees **Additional Specifications** **Housing:** Polyurethane **Connectors**: Nickel-plated brass **Coupling Nuts:** Stainless steel **Operating Temperature**: -22° to 176°F (-30° to 80°C) **No. of Pins:** 5	Eurofast	
	NDN-6B11	4-port junction tee, minifast bus connection, eurofast device ports
	NDN-6B12	6-port junction tee, minifast bus connection, eurofast device ports
	Minifast	
	NDN-6B21	4-port junction tee, minifast bus connection and device ports
	NDN-6B22	6-port junction tee, minifast bus connection and device ports

Item	Part Number & Description	
Terminators Two terminators are required per each DeviceNet trunkline. The terminators should be located at each physical end of the trunkline. **Additional Specifications** **Connector**: Polyurethane, 300V rating **Contact Materials**: Gold plated copper alloy **Coupling Nuts**: Nickel plated brass **Protection**: NEMA 1,3,4,6p **Operating Temperature**: -40° to 170°F (-40° to 80°C) **No. of Pins:** 5	Eurofast Bus Terminator	
	NDN-6C11	Male eurofast connector, internal resistor
	NDN-6C12	Female eurofast connector, internal resistor
	Minifast Bus Terminator	
	NDN-6C21	Male minifast connector, internal resistor
	NDN-6C22	Female minifast connector, internal resistor

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Bus Extenders & Repeaters

502.969.8000

DeviceNet™ Bus Extenders and Repeaters provide a means of extending the DeviceNet cable to its maximum lengths without reducing communication speed.

Item	Part Number & Description
Bus Extenders/Repeaters General Specifications **Maximum Voltage:** 11 to 25VDC **Maximum Power**: 1.8 watts **Operating Temperature:** 32° to 158°F (0° to 70°C) **Protection:** IP65	**NDN-7A01** Bus extender/repeater - manual or automatic speed selection: 125K, 250K, 500K, baud rates - multiple extenders can be used in series - 1 ms latency for each network extension - DIN rail mountable **NDN-7A02** Fiber-optic bus extender/repeater with ST connectors - compatible with 62.5/125 µm multimode cable - maximum distance: 2200 m - pairs of repeaters are required (one at each end of fiber-optic cable - panel-mount, 4 screws
Repeater This modules provides a QDC style DeviceNet repeater to overcome DeviceNet system wiring and/or communication limitations. Specifications **Housing**: Glass filled nylon; nickel plated brass connectors **Operating Temperature**: -13° to 158°F (-25° to 70°C) **Bus Power**: 11-30VDC **Node Current Consumption**: 125mA segment A, 30mA segment B **Protection**: NEMA 1,3,4,12,13; IP67	**NDN-7B01** DeviceNet Repeater

Field Wirable Connectors

TOPWORX

DeviceNet

DeviceNet™ These plug style connectors are designed for easy installation in the field after the DeviceNet wiring has been routed through the conduit, wire-ways, panel enclosures, and other locations.

General Specifications

Operating Temperature: -40° to 185°F (-40° to 85°C)
Protection Class: IP67

Item	Part Number & Description
Minifast Connectors Additional Specifications **Housing**: Nylon **Connector Insert**: Polyurethane **Contact Materials**: CuZn plated copper alloy **Coupling Nuts**: Anodized aluminum **Protection**: NEMA 1,3,4,6,13 **Rating**: 9A, 300VDC **No. of Pins**: 5	Female Connectors **NDN-MFT** Minifast female field wirable connector, thin cable **NDN-MFH** Minifast female field wirable connector, thick cable Male Connectors **NDN-MMT** Minifast male field wirable connector, thin cable **NDN-MMH** Minifast male field wirable connector, thick cable
Eurofast Connectors For use with thin and medium DeviceNet cable only. Additional Specifications **Housing**: Polyester, PBT Black **Connector Insert**: PBT **Contact Materials**: Nickel plated copper alloy **Coupling Nuts**: Female - PBT; Male - Nickel Plated Brass **Protection**: NEMA 1,3,4,6P **Rating**: 3A, 36VDC **No. of Pins**: 5	Female Connectors **NFC-EFS** Eurofast straight female field wirable connector, thin cable **NFC-EFR** Eurofast right angle female field wirable connector, thin cable Male Connectors **NFC-EMS** Eurofast straight male field wirable connector, thin cable **NFC-EMR** Eurofast right angle male field wirable connector, thin cable

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Molded Connector Cordsets

502.969.8000

DeviceNet™ These cordsets provide DeviceNet cable with pre-installed, plug-in connectors, reducing installation time in the field.

Available in 1, 3, 5, and 10 meter lengths. Consult the factory for additional cordset lengths.

Item	Part Number & Description
Molded Connector Cordsets	**To complete your cordset part number:** 1) Select your connector types 2) Select your cable type from the list below (* = cable type) 3) Select your cordset length from the chart below (☐ = cordset length) *Example* *NDN-DMDC1-1 = DeviceNet "Thin" cable double connector cordset, 1 m*

TopWorx offers DeviceNet molded connector cordsets in DeviceNet Thin, Medium, and Thick (300V and 600V) cable.

Cordsets are available with a molded connector on each end or with one end bare to facilitate routing of cable through conduit or panel enclosures.

All double cordsets have one straight male connector and one straight female connector.

See page 89 for cable specifications.

Connector Specifications

Plug Body: Molded polyurethane
Contacts: Gold plated brass
Coupling Nuts: Nickel plated brass
Temperature: -40° to 158°F (-40° to 70°C)
Protection: NEMA 1,3,4,6,13; IP67
Rated Current: 9.0A (minifast)

Double Minifast Connector Cordsets

NDN-DM*-☐

Single Minifast Connector Cordsets

NDN-MM*-☐ Male Connector

NDN-MF*-☐ Female Connector

*** Cable Types**

DC1 = DeviceNet "Thin" cable

DC2 = DeviceNet "Medium" cable

DC3 = DeviceNet "Thick" cable, 300V

DC4 = DeviceNet "Thick" cable, 600V

☐ Cordset Length

Part Number ☐	Cordset Length
1	1 m
3	3 m
5	5 m
10	10 m

Consult factory for additional cordset lengths.

DeviceNet Bulk Cable

TOPWORX

DeviceNet™ Cable that meets the requirements of ODVA.

Available in 30, 75, and 150 meter spools. Consult the factory for additional cable lengths.

Quick Connect - Field wirable connectors, page 87

General Specifications

Materials: PVC
Rating: To 176°F (80°C)

Item	Part Number & Description
DeviceNet Bulk Cable	**To create your bulk cable part number, use the chart below to select the appropriate cable length for your application, where ☐ = cable length.** *Example* *NDN-DC1-030 = DeviceNet "Thin" cable in 30 meter spool*

DeviceNet Thin Cable meets ODVA Type I cable requirements. This cable can be used from drop lines with a maximum length of 6 meters or as trunkline cable in networks with a maximum length of 100 meters.

DeviceNet Medium Cable meets ODVA Type III cable requirements. This cable can be used as trunkline cable in networks with a maximum length of 300 meters.

DeviceNet Thick Cable meets ODVA Type II cable requirements. This cable can be used as trunkline cable in networks with a maximum length of 500 meters.

Bulk Cable Types

NDN-DC1-☐ DeviceNet "Thin" cable, 300V

NDN-DC2-☐ DeviceNet "Medium" cable, 300V

NDN-DC3-☐ DeviceNet "Thick" cable, 300V

NDN-DC4-☐ DeviceNet "Thick" cable, 600V

Part Number ☐	Cable Length
030	30 m
075	75 m
150	150 m

Consult factory for additional cable lengths.

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DeviceNet™ Our handheld diagnostic and troubleshooting device with a simple user interface is a powerful startup, verification, and troubleshooting tool for any DeviceNet network, featuring NetAlert diagnostic capabilities.

Item	Part Number & Description
Handheld Diagnostic Tool	
The NDN-DT8 provides two modes for monitoring and troubleshooting DeviceNet segments. AUTO search mode rapidly measures key DeviceNet parameters and provides a good, warning, or fault indication. In Expert mode, the NDN-DT8 can be used to monitor a wide array of DeviceNet segment parameters including max/min bus power voltage, max/min CAN bus voltage, error rate, error counter, percent of bandwidth used, as well as device specific traffic and error rates.	**NDN-DT8** Diagnostic and troubleshooting tool - includes carrying bag with strap

General Specifications

Power Supply: Network 11-30VDC < 150mA

Batteries: (2) AA alkaline batteries

Connectors: (1) micro per ODVA (M12), adaptor cables; (2) included for mini-change and pluggable screw terminal

Band Rates: 125K, 250K, and 500K (Auto-detect)

Analog Accuracy: Bus power ± 100mV; Bus signal ± 20mV

Notes

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DP Device Bus Network PA Process Control Network

Profibus Overview

The Profibus protocol was created in 1989 in Germany by a consortium of factory automation suppliers. Originally developed to enable discrete manufacturing, it has expanded into process automation and enterprise-wide applications.

Profibus encompasses several Industrial Bus Protocol Specifications, including Profibus-DP, Profibus-PA, Profibus-FMS, and PROFInet.

Profibus-DP is device level bus that supports both analog and discrete signals. Profibus-DP has widespread usage for such items as remote I/O systems, motor control centers, and variable speed drives. Profibus-DP communicates at speeds from 9.6 Kbps to 12 Mbps over distances from 100 to 1,200 meters. Profibus-DP doesn't natively support Intrinsically Safe installations.

Profibus-PA is a full-function fieldbus that is generally used for process level instrumentation. Profibus-PA communicates at 31.25 Kbps and has a maximum distance of 1,900 meters per segment. Profibus-PA is designed to support Intrinsically Safe applications.

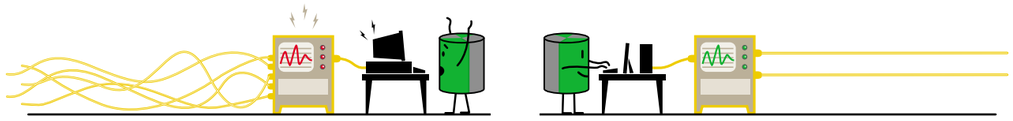
Profibus-FMS is a control bus generally used for communications between DCS and PLC systems, while PROFInet is a protocol being developed to allow Profibus communications across Ethernet Networks.

Profibus Network Highlights

Type of Network	
DP	Device Bus
PA	Process Control Network
FMS	Control (cell level) Network
Physical Media	Twisted pair, fiber
Network Topology	Bus, Ring, Star
Maximum Devices	
DP	max. 126 stations on one bus (maximum of 244 bytes input and output data possible for each slave)
PA	32 nodes/segment 4-6 per repeated segment depending on power requirements of devices and the type of I.S. barrier used.
Maximum Distance	
DP	93.75Kbps and less – 1200 meters 500Kbps – 400 meters 1.5Mbps – 200 meters 12Mbps – 100 meters
PA	1,900 meters
Max Distance with repeater (max. of 4 repeaters can be used)	9,500 meters with repeaters
Communication Methods	
DP	Peer-to-peer, multicast or cyclic master-slave (uses token passing sequence)
PA	Client/server, Publisher/subscriber, Event Both Scheduled and Unscheduled communications
Primary usage	
DP	Used for Discrete and Analog for PLC, Variable Speed Drives, Remote I/O communications
PA	Analog and discrete process control devices
Power and Communications	
DP	Power is supplied separately from communications bus (can be supplied on a parallel power bus)
PA	Requires PA power supply (conditioner) to protect the digital communications
Device Power Supply	
DP	Devices are powered separately from communications bus
PA	Can be supplied from bus (typical)
Wiring Types	
DP	Shielded twisted pair #22 AWG
PA	Shielded twisted pair #18AWG (0.8mm) 1900m (6232 ft.)
Device Addressing	DIP switch settings or handheld/software
Governing Body	PROFIBUS International (PI)
Web Site	**www.profibus.com**

Conventional I/O System vs. Profibus Network

Profibus offers a variety of solid solutions for all levels of process automation.



CONVENTIONAL I/O SYSTEM

Advantages
- Technology is already understood
- Lower device cost
- Independent wiring from devices to the control system means wiring problems with one device don't affect other field devices

Drawbacks
- Higher installed cost
- Point-to-point wiring is expensive
- Many wiring connections:
  - are labor intensive to install
  - create many points of failure
  - increase complexity when troubleshooting
  - require large amounts of cabinet or rack space for installation of terminal blocks
  - create time-consuming initial checkout and startup
- Expansion requires duplicating the entire wiring scheme for each additional point

PROFIBUS DP-PA-FMS NETWORKS

Advantages
- Widely accepted, with 1,100 member companies worldwide.
- Network support at the device, process control, and Ethernet levels
  - Interfaces are available for variable speed drive and motor control center applications (Profibus-DP)
  - Process instrumentation available with Profibus-PA devices
  - Enterprise-wide applications with PROFInet
- Intrinsically Safe installations available for Profibus-PA instruments
- Gateways allow for Profibus-PA integration directly to Profibus-DP networks
- Host interfaces available for most PLC, DCS and computer systems
- Gateway devices available to directly support lower cost Sensor Bus networks, especially AS-Interface
- More than 2,000 available products

Drawbacks
- Profibus-DP does not support Intrinsically Safe installations
- No control in the field capabilities
- Segment wiring, power, grounding, shielding and termination requirements must be adhered to in the design and installation

PROFIBUS-DP NETWORK

Advantages
- Based on RS-485 physical layer
- Multiple bus transmission speeds and wiring length combinations:
  - Up tp 1000 m distance at 9.6kbits/sec, expandable to 2000 m using repeaters
  - Up to 200 m at maximum speed of 1500kbits/sec.
- Supports both discrete and analog signals
- I/O modules allow connection of conventional analog and discrete devices
- Interfaces available for many variable speed drives, motor control centers, and field devices
- Supports 32 devices per segment, 62 with repeaters
- Supports mono-master and multi-master systems
- Simple integration of new devices to an existing system

Drawbacks
- Not available for Intrinsically Safe installations
- Slaves not powered by network wiring, require separate power source
- Addressing set manually (not dynamic)

Profibus-DP is recommended
- For time critical analog and discrete applications due to its high speed capabilities
- Where variable frequency drives and motor control centers can incorporate bus technologies
- For a mixture of conventional analog and discrete devices

TopWorx Comments on Profibus

Strengths

Profibus offers more choices. Profibus is the only bus protocol that offers different solutions for process automation (PA), factory automation (DP), and enterprise-wide (Net).

Profibus is well accepted across multiple industries, especially in Europe.

Limitations

Profibus has had limited success gaining market share in North America, particularly in the process industries.

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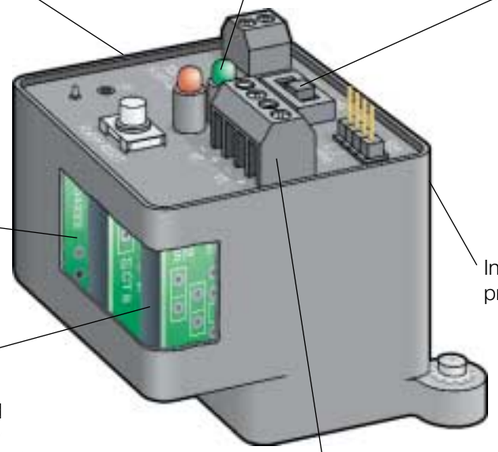
DP Device Bus Network PA Process Control Network

Profibus Sensor-Communications Module

The TopWorx Sensor-Communications Module (SCM) combines position sensors, Profibus communication, solenoid outputs, and wiring terminals into a compact enclosure that is potted and sealed from the environment.

SCM-PB enclosure is **resistant to high levels of impact, moisture, shock, and vibration.**

Britelite LEDs indicate valve position and facilitate sensor set up.



Calibration Switch facilitates initial setup. The three position On-Off-PB switch enables the valve to be test cycled open and closed offline, then put onto the network when ready.

All electronics are **short-circuit protected,** eliminating the expense of adding separate short-circuit protection.

Integrated position sensors provide valve position feedback.

All micro-processor based electronics are completely **potted and sealed,** preventing premature failure due to moisture or contamination.

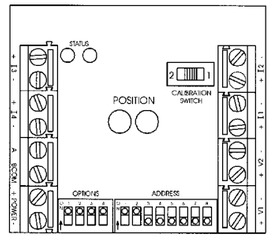
Onboard terminals provide connection points for **auxiliary discrete and analog inputs.**

SCM-PB Highlights

The Sensor-Communications Module delivers valve position feedback, communicates directly on the Profibus DP network, pilots the valve actuator, and provides extra wiring terminals for auxiliary inputs.

The TopWorx SCM-PB is a compact, sealed module that can be used in a variety of enclosures suitable for use in any hazardous or corrosive process environment.

4 Discrete Inputs (DI)	Open/Closed valve position feedback
2 Discrete Outputs (DO)	Solenoid outpts for single or double acting
1 Analog Input (AI)	Optional 4-20mA input
Calibration Switch	Open-Close-Profibus
Status/Warning LEDs	Open, Closed, Alarm State
PTO Conformance Tested	Yes
Short Circuit Protection	Yes
Maximum Current	160mA per output
Maximum Power	4 watts per output
Voltage	24VDC
Diagnostic Features	
Cycle Counter	Records number of cycles
Cycle Time Alarms	User settable values for Open & Close cycle times
Visual Alarm Indication	Blinking LEDs



SCM-PB Wiring Diagram

The Profibus Sensor-Communications Module fits conveniently into a variety of valve control enclosures suitable for any process environment.

Lumitech DVC-PB
Discrete Valve Controller
- Zone 2 (Class I, Div 2)
- Integral Solenoid Valve
- Direct Mount

See page 130 for more details.

Lumitech DVM-PB
Discrete Valve Monitor
- Zone 2 (Class I, Div 2)
- Direct Mount

See page 132 for more details.

Did You Know?

The Profibus Sensor-Communications Module enables TopWorx discrete valve controllers to connect directly to the Profibus-DP network, eliminating the need and expense of AS-i to Profibus gateways.

Switchpak DXP-PB
Switchpak DXS-PB (Stainless Steel enclosure)
Discrete Valve Monitor
- Zone 1 (Class I, Div 1)

See page 134, 136 for more details.

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The Profibus DP device bus network was originally designed to be used for factory automation rather than process automation. Therefore, in the process industries there has been a need for easy, cost-effective ways to make wiring connections in hazardous areas.

Our HazLink products are rugged junction enclosures that provide flexible wiring options in hazardous areas, making AS-Interface more suitable for use in the process industries.

HazLink Features: Zone 1 (Class I, Div 1)
(3) 3/4" NPT conduit outlets

HazLink Options: I/O Modules
Wiring Tees
Disconnect Switches

Item

HazLink Connectivity Enclosure

General Specifications

Enclosure: Die-cast aluminum; O-ring sealed

Coating: Dichromate conversion (inside); powder polyester coating (outside)

O-rings: Buna N

Cover: Screw cover with O-ring seal

Conduit Outlets: Three 3/4" NPT

Environment: NEMA Type 4, 4X, 7 and 9

Approvals: Explosion Proof
Zone 1
Class I, Div 1 & 2, Groups A,B,C,D
Class II, Div 1 & 2, Groups E,F,G

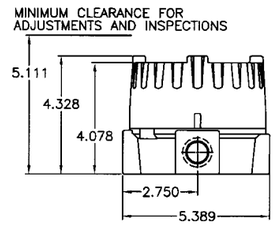
I/O Modules

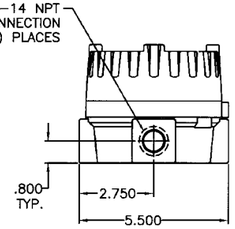
HazLink I/O Modules allow users to cost-effectively connect new or existing conventional devices into the Profibus DP network in Zone 1 (Class I, Div 1) hazardous areas.

NHL-PBIO Hazlink Connectivity Enclosure with Profibus I/O
4 input, 2 output knifegate valve or cylinder controller

Profibus

Dimensions



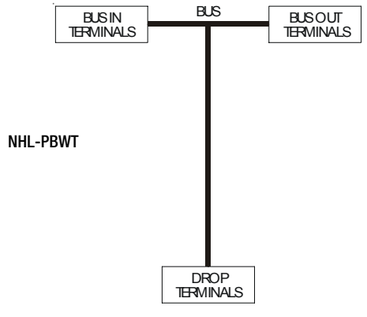


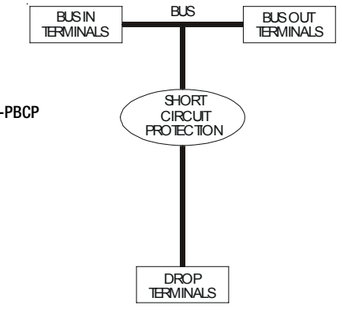
Wiring Tees

HazLink Wiring Tees make it easy to connect field devices to bus lines using wire terminals or plug-in connectors.

NHL-PBWT Profibus tee with 3 x 5 position wiring terminals

NHL-PBCP Short circuit protection





Disconnect Switches

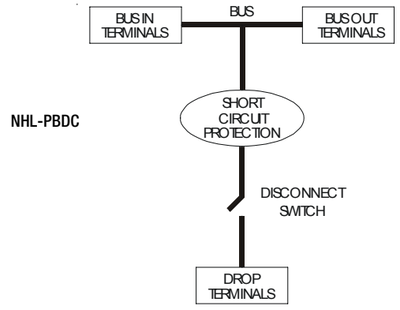
HazLink Disconnect Switches enable users to repair or replace a field device without disturbing the network with the simple flip of a lever-operated switch.

Disconnect Switches are designed to be locked if desired. Locking prevents tampering or accidental device connection or disconnection.

TopWorx offers Disconnect Switches in HazLink enclosures with or without short circuit protection.

NHL-PBDS Disconnect switch

NHL-PBDC Disconnect switch with short circuit protection



AS-i to Profibus DP Gateways

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AS-i to Profibus DP Gateways provide a means of easily connecting an AS-i network to a higher level Profibus DP network. The Gateway is recognized as a single node on the higher level Profibus DP network while controlling the field devices on the AS-Interface network.

General Specifications

Operating Temperature: 32° to 131°F (0° to 55°C)
Mounting: DIN rail
Voltage of insulation: ≥ 500V
Protection Category: Housing IP40, Terminals IP20
AS-i Specification: 2.1

Item	Part Number & Description

AS-i to Profibus DP Gateways

Gateway

Gateway with graphical display

Functions as a master on the AS-i network and as a single node on the Profibus DP network.

Dual Gateways function as two complete masters on the AS-i network and as a single node on the Profibus DP network.

These devices include demonstration software that performs addressing, monitoring, and diagnostics of the network.

Additional Specifications

Connection Type: Screw terminals

Gateway

Operating Voltage: 30VDC AS-i voltage

Operating Current: 200mA (from AS-i circuit)

Dual Gateway

Operating Voltage: 24VDC

Operating Current:
AS-i Power: 200mA (from AS-i 1), 70mA (from AS-i 2)
Standard Power: 70mA (from each AS-i), 150mA at 18VDC (from power)

Check out also
- D-sub-data transmission cords, page 117
- Master simulators for testing, page 99

Single Gateways

	Graphical Display	Power Supply
NAS-GP11	Yes	AS-i
NAS-GP12	No	AS-i

Dual Gateways

	Serial Interface	Power Supply
NAS-GP21	Yes	AS-i
NAS-GP22	No	AS-i
NAS-GP23	Yes	Standard
NAS-GP24	No	Standard

Profibus DP Master Simulator

TOPWORX

Profibus

The Profibus DP Master Simulator is used to connect a PC to a Profibus DP segment for configuration of Profibus DP slave devices, including the configuration of Profibus DP gateways. This tool is particular useful for Profibus devices in the IP67 protection class that do not have DIP switches for address configuration.

Item	Part Number & Description

Profibus DP Master Simulator

The Master Simulator includes RS 232 / RS 485 converter and monitoring software.

General Specifications

Operating Temperature: 32° to 131°F (0° to 55°C)
Operating Current: < 60mA
Power Supply: From the RS485 interface of the Profibus slave (5V)
Transfer Rate: 19200 Baud
Interfaces: Standard PC RS232 interface with 9-pin D-sub-plug (female); RS485-interface with 9-pin D-sub-plug (male)
Cable Length: RS 232 and RS 485: max. 2 m

NPB-1A01	Profibus DP Master Simulator

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Profibus DP Modular I/O is DIN rail mountable and recommended for high density, low-cost applications. The modular I/O system is connected to the Profibus DP segment via the fieldbus coupler. Input/Output Modules can contain a mixture of analog, discrete, and speciality modules to meet your specific application requirements.

General Specifications

Operating Temperature: 32° to 131°F (0° to 55°C)
Protection Class: IP20
Connection: Cage clamp wiring connections

Item	Part Number & Description
Profibus DP I/O Coupler  The Profibus DP network may contain any assortment of discrete, analog, and specialty modules offered below. The Profibus DP I/O Coupler supports I/O Modules that can contain a maximum of 256 digital or 122 analog signals. The Profibus DP node address is easily selected by two encoder switches on front of bus coupler. The fieldbus coupler requires 24VDC power supply and terminals are provided for 24VDC power connection to field I/O devices (max. 10A). Network connection is via a 9 pin Sub D style connector. Check it out! - Field wirable D9 connectors, page 104	**NPB-2A01** Profibus DP fieldbus coupler, DP/V1, 12 MBaud
Discrete I/O Modules These Discrete I/O modules are designed for use with the coupling module above to provide a means of integrating conventional discrete I/O into a Profibus DP network. Discrete signals are transferred by the bus coupler bit by bit. When digital information exceeds 8 bits, a new byte is automatically started. Additional Specifications **Approvals:** Class 1, Div 2 (except Relay Output Modules)	Inputs **NMI-DN01** 4-channel digital input, 24VDC, 3.0 ms input filter **NMI-DN02** 2-channel digital input, 120VAC Outputs **NMI-DT01** 4-channel digital output with diagnostics, 24VDC 0.5A output current **NMI-DT02** 2-channel digital output with diagnostics, 24VDC 2.0A output current Relay Outputs **NMI-DR01** 2-channel relay output, non-floating, 2 SPST contacts Switching voltage: 250V AC/30VDC Switching current: 2.0A AC/DC **NMI-DR02** 2-channel relay output, 2 SPST contacts Switching voltage: 250VAC/30VDC Switching current: 2.0A AC/DC **NMI-DR03** 2-channel relay output, 2 SPDT contacts Switching voltage: 125VAC/30VDC Switching current: 0.5A AC/1.0A DC

Item	Part Number & Description
DIN Analog I/O Modules These Analog I/O modules are designed for use with the Fieldbus Coupling module to provide a means of integrating conventional analog devices into a Profibus network. Analog signals are transferred via bytes or words. Additional Specifications **Approvals:** Class 1, Div 2 (except Thermocouple modules)	Inputs **NMI-AN01** 2-channel analog input, RTD, PT100 sensor type **NMI-AN02** 2-channel analog input, 0-10VDC, single ended **NMI-AN03** 4-channel analog input, 0-10VDC, single ended **NMI-AN04** 2-channel analog input, type K thermocouple (-148° to 2498°F) **NMI-AN05** 2-channel analog input, type J thermocouple (-148° to 2192°F) **NMI-AN06** 2-channel analog input, 0-20mA, Overload protection, 16Bit **NMI-AN07** 2-channel, 4-20 mA, Overload protection, 16Bit Outputs **NMI-AT01** 2-channel analog output, 0-10VDC **NMI-AT02** 2-channel analog output, 0-20mA **NMI-AT03** 2-channel analog output, 4-20mA
Power Supply Modules These modules can be added to distribute power to field devices via the I/O system. Power is supplied from an external source. See our Power Supply section when 24VDC is required.	**NMI-PS01** 24VDC, 2A power supply **NMI-PS02** 24VDC, max. 6.3A with diagnostics and fuse-holder **NMI-PS03** 230VAC, max. 6.3A with diagnostics and fuse-holder **NMI-PS04** 120VAC, max. 6.3A with fuse-holder, no diagnostics
Separation & End Modules A separation module provides a visual and an electrical separation between field I/O power types (i.e. 24VDC from 120VAC modules). One end module is required at the physical end of each I/O System, with one per Bus Coupler.	**NMI-SM01** Separation module **NMI-EM01** End module

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Quick Disconnect I/O Modules & Accessories

Quick Disconnect Input/Output Modules provide a method of connecting conventional field devices to a Profibus DP Network with quick disconnect (QDC) style connectors in a rugged, field mountable unit.

QDC Accessories provide physical layer connectivity for a Profibus DP network.

General Specifications

Housing Material: Glass filled nylon; nickel plated brass connectors
Operating Temperature: 32° to 151°F (0° to 55°C)
Protection Class: NEMA 1,3,4,12,13; IP67

Item	Part Number & Description

Robust I/O Modules

These modules allow for the address to be selected via two rotary switches under protective cover and have a communication rate up to 12 Mbps, auto-adjusted to the master device.

	Inputs	Outputs	Output Current
NPB-3A01	8	-	-
NPB-3A02	16	-	-
NPB-3A03	-	8	0.5A
NPB-3A04	-	8	2.0A
NPB-3A05	-	16	0.5A
NPB-3A06	8	8	0.5A
NPB-3A07	8	8	0.5A

Additional Specifications

Combatibility: PNP
Internal Current Consumption: <110mA (input stations only)
<150mA (stations with outputs)
Input Voltage: 18 to 30VDC
Input Current: <500mA per 8 inputs, short-circuit protection
Output Voltage: 18 to 30VDC
Input Short-circuit Protection: Group
Output Short-circuit Protection: Individual
No. of Pins: 5

Requires external power source that is connected via minifast connector on front. See our selection of Power Supplies on page 116.

Terminator

Terminators are required at each physical end of a Profibus DP to prevent signal reflections and to provide a defined idle level on the bus. This minimizes communication errors on the bus and maximizes transmission efficiency.

NPB-3B01	Terminating resistor

Specifications

Connector: Polyurethane body material & contact carrier, 300V rating
Coupling Nuts: Nickel plated brass
Temperature: -40° to 170°F (-40° to 80°C)
Protection: NEMA 1,3,4,6p
Rating: 50VDC
No. of Pins: 5

Quick Disconnect Accessories

These Quick Disconnect (QDC) Accessories provide physical layer connectivity for a Profibus DP network.

Tees provide a means of connecting and disconnecting devices to the Profibus network with no interruption or loss of communications to other devices on the bus.

General Specifications

Protection: IP67

Item	Part Number & Description

Bus Tee

This tee allows the connection of devices to a Profibus DP communications bus. The tee allows removal and installation of a signal device without disruption of communications on the Profibus DP segment.

NPB-3C01	Profibus DP fully shielded eurofast bus tee

Additional Specifications

Housing Material: Aluminum with gold-plated brass contacts
Coupling Nuts: Nickel plated brass
Temperature: -40° to 176°F (-40° to 80°C)
Protection: NEMA 1,3,4,6
Rating: 4A, 250V
No. of Pins: 5

Power Tee

This tee is rated at 9A and 600V and is used when providing external power to multiple Profibus DP slave devices.

See our selection of power supplies on page116.

NPB-3D01	Profibus DP minifast power tee

Additional Specifications

Connector: Oil resistant polyurethane, contact carrier, 300V rating
Contact Materials: Gold plated brass
Coupling Nuts: Nickel plated brass
Temperature: -40° to 221°F (-40° to 105°C)
Protection: NEMA 1,3,4,6p
Rating: 9A, 600V
No. of Pins: 5

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Field Wirable Connectors

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These plug style connectors are designed for easy installation in the field after the Profibus wiring has been routed through the conduit, wire-ways, panel enclosures, and other locations.

General Specifications

Operating Temperature: -40° to 185°F (-40° to 85°C)
Protection Class: NEMA 1,3,4,6p; IP67

Item	Part Number & Description
Eurofast Connectors Additional Specifications **Housing**: Polyester, PBT Black **Connector Insert**: PBT **Contact Materials**: Nickel plated copper alloy **Coupling Nuts**: Female - PBT; Male - Nickel Plated Brass **No. of Pins**: 5	Female Connectors **NPB-EFS** Straight female field wirable connector **NPB-EFR** Right angle female field wirable connector Male Connectors **NPB-EMS** Straight male field wirable connector **NPB-EMR** Right angle male field wirable connector
Profibus-DP Field Wirable D9 Connector	**NPB-4A01** Right angle 9-pin Sub D connector

Molded Connector Cordsets

TOPWORX

Profibus

These cordsets provide Profibus DP cable with pre-installed, plug-in connectors, reducing installation time in the field.

Available in 1, 3, 5, and 10 meter lengths. Consult the factory for additional cordset lengths.

Item	Part Number & Description
Molded Connector Cordsets  TopWorx offers Profibus DP molded connector cordsets in Profibus DP PVC and PUR cable. Cordsets are available with a molded connector on each end or with one end bare to facilitate routing of cable through conduit or panel enclosures. All double cordsets have one straight male connector and one straight female connector. See page 106 for cable specifications. Connector Specifications **Plug Body:** Molded polyurethane **Contacts:** Gold plated brass **Coupling Nuts:** Nickel plated brass **Temperature:** -40° to 158°F (-40° to 70°C) **Protection:** NEMA 1,3,4,6,13; IP67 **Rated Current:** 4.0A (eurofast)	**To create your cordset part number:** 1) Select your connector types 2) Select your cable type from the list below (* = cable type) 3) Select your cordset length from the chart below (☐ = cordset length) *Example* *NPB-DEPC1-1 = Profibus DP PVC double connector cordset, 1 m* Double Eurofast Connector Cordsets **NPB-DE*-☐** Single Eurofast Connector Cordsets **NPB-EM*-☐** Male eurofast connector **NPB-EF*-☐** Female eurofast connector *** Cable Types** **PC1** = Profibus DP PVC cable **PC2** = Profibus DP PUR cable **☐ Cordset Length** Consult factory for additional cordset lengths.

Part Number ☐	Cordset Length
1	1 m
3	3 m
5	5 m
10	10 m

Profibus Bulk Cable

502.969.8000

Cable that meets the requirements of EN50170-2-2:1996 for communications up to 12Mbaud.

Available in 30, 75, and 150 meter spools. Consult the factory for additional cable lengths.

General Specifications

Rating: 300V, 176°F (80°C)
Type of Drain Wire: Foil/Braid; 22AWG

Item	Part Number & Description
Profibus Bulk Cable Quick Reference - Field wirable connectors, page 104	**To create your bulk cable part number, use the chart below to select the appropriate cable length for your application, where ☐ = cable length.** *Example* *NPB-PC1-030 = Profibus DP PVC cable in 30 meter spool* Bulk Cable Types **NPB-PC1-☐** Profibus DP PVC cable, abrasion resistant **NPB-PC2-☐** Profibus DP PUR cable, oil and abrasion resistant

Part Number ☐	Cable Length
030	30 m
075	75 m
150	150 m

Consult factory for additional cable lengths.

Diagnostic Tools

TOPWORX

Our Profibus diagnostic tool is a powerful, handheld Profibus network test tool that can be used for installation, startup, and troubleshooting.

Item	Part Number & Description
Diagnostic Tools  During installation and startup, the device can be used to verify wiring integrity, bus impedance, existence of terminating resistors, crossed-wires, proper cable type, broken shielding, proper signal strength, slave devices addresses and identification. The NPB-DT7 can perform passive monitoring of signal levels, baud rate, and reflections on an active Profibus segment. The NPB-DT7 can take the place of the Profibus Master to troubleshoot failed devices, wiring breaks, transmission errors, and other vital statistics that help to quickly locate and correct Profibus network problems. The NPB-DT7 has a flash memory that allows storing of 20 test reports for later printing via the RS 232C port and a standard PC. General Specifications **Connections:** DB9 connector **Profibus Data Range**: 9600 bits to 12 Mbits **Measuring inaccuracy with connected devices**: ±10% **Measuring inaccuracy without connected devices**: ±5% **Operating Temperature:** 50° to 104°F (10° to 40°C) **Protection:** NEMA 3; IP50 Plug Charger Specifications **Input Voltage Range**: 100-240VAC, 50-60 Hz **Max. Input Current**; 120mA **Power Input**: max. 12VA **Operating Temperature:** 32° to 86°F (0° to 30°C) **Protection:** IP50	**NPB-DT7** Profibus Test Tool Set - Handheld testing device - Transportation case - 2 accumulators - Power supply - RS-232 cable - Profibus stub line & T-connection cable - Several gender changers - Detailed manual containing troubleshooting hints & guidelines

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Modbus Overview

The Modbus protocol was originally developed by Modicon in 1978 to exchange information between products on the factory floor. This protocol became a de facto standard for exchanging data and communication information between PLC systems.

Modbus devices communicate over a serial network in a master/slave (request/response) type relationship using one of two transmission modes: ASCII (American Standard Code for Information Interchange) mode or RTU (Remote Terminal Unit) mode.

In ASCII mode, two eight-bit bytes of information are sent as two ASCII characters. The primary advantage of ASCII mode is the flexibility of the timing sequence. Up to a one second interval can occur between character transmissions without causing communication errors.

In RTU mode, data is sent as two four-bit, hexadecimal characters, providing for higher throughput than in ASCII mode for the same baud rate.

Enhancements to Modbus include Modbus Plus and Modbus/TCP protocols, both of which allow Modbus information to be encapsulated in a network structure to support peer-to-peer communications. Modbus Plus communicates via a single twisted pair of wires and uses a token passing sequence for peer communication sequences. Modbus/TCP is an open standard designed to facilitate Modbus message transfer using TCP/IP protocol and standard Ethernet networks.

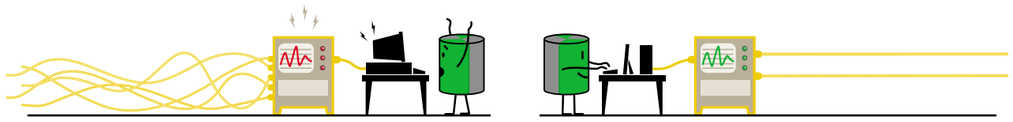
TopWorx's Modbus devices are designed to operate as slave devices on a Modbus network for discrete valve control.

Modbus Network Highlights

Type of Network	
ASCII/RTU	Device Bus
ModbusPlus	Control Bus
Physical Media	Shielded twisted pairs in one shielded cable
Network Topology	Bus, tree, star with drops
Maximum Devices	
ASCII/RTU	One to one communications
ModbusPlus	32 (up to 64 with repeater)
Maximum Distance	
ASCII/RTU	350m
ModbusPlus	1500m (6000m with repeaters)
(up to 3 repeaters may be used)	(min. 1m between devices)
Communication Methods	
ASCII/RTU	Master-Slave Query-Response Cycle (LRC error checking for ASCII) (CRC error checking for RTU)
ModbusPlus	Peer to Peer (Token passing logical ring)
Primary usage	
ASCII/RTU	Serial Communications for PLC, Variable Speed Drives, Control Systems, etc.
ModbusPlus	linking MODBUS and/or RS232/RS485 devices in a peer-to-peer network
Power Supply	12VDC, not used for devices
Power and Communications	Communications only on bus 12VDC, max. 300mA (100mA typical)
Device Power Supply	Devices must be powered separately from communications bus
Wiring Types	
(types used varies on application)	Shielded Twisted Pair #18AWG (0.8mm)
Grounding aspects	Floating communications bus
Shielding	Grounded at one end
Area Classification	General Purpose
Device Addressing	Switch or software selectable
Governing Body	MODBUS.ORG
Web Site	**www.modbus.org**

Conventional I/O System vs. Modbus Network

Modbus is a well understood and broadly used protocol for industrial digital communications.



CONVENTIONAL I/O SYSTEM

Advantages
- Technology is already understood
- Slightly lower device cost
- Independent wiring from devices to the control system means wiring problems with one device don't affect other field devices

Drawbacks
- Higher installed cost
- Point-to-point wiring is expensive
- Many wiring connections:
  - are labor intensive to install
  - create many points of failure
  - increase complexity when troubleshooting
  - require large amounts of cabinet or rack space for installation of terminal blocks
  - create time-consuming initial checkout and start-up
- Expansion requires duplicating the entire wiring scheme for each additional point

MODBUS NETWORK

Advantages
- Well understood and documented protocol
- Widely supported protocol by many host PLC, DCS and process systems
- Protocol is already used in many facilities

Drawbacks
- Limited use as a device bus
- Limited diagnostic capabilities for device applications
- Separate power required for device operations

Recommended
- When similar Modbus devices are being used
- When Modbus network is pre-existing
- When Modbus protocol is well understood and is being used extensively as a facility standard

TopWorx Comments on Modbus

Strengths
Modbus is well accepted and well understood by many in the world of industrial communications.

Modbus delivers cost-effective simplicity with a bit of added functionality supporting limited diagnostic information.

Limitations
The selection and availability of field devices that support the Modbus protocol is limited, especially in the process industries.

From the field device perspective, Modbus is a bit cumbersome to configure with today's advanced process control systems.

Modbus does not support field devices effectively in intrinsically safe applications.

When to Use Modbus
Generally speaking, TopWorx recommends Modbus when:
- device populations are primarily discrete
- end users already have an existing control system that supports Modbus
- end users have a legacy control system that does not support other common protocols
- plants are not intrinsically safe

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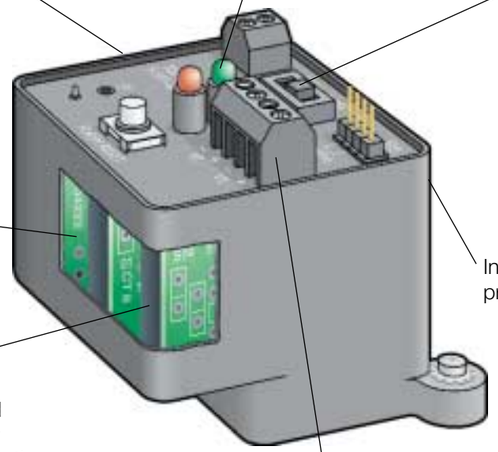
Device Bus Network

Modbus Sensor-Communications Module

MODBUS

The TopWorx Sensor-Communications Module combines position sensors, Modbus communication, solenoid outputs, and wiring terminals into a compact enclosure that is potted and sealed from the environment.

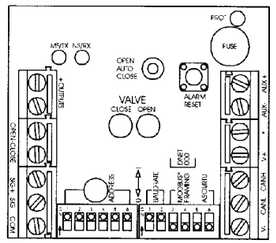


SCM-MB Highlights

The Sensor-Communications Module delivers valve position feedback, communicates directly on the Modbus network, pilots the valve actuator, and provides extra wiring terminals for auxiliary inputs.

The TopWorx SCM-MB is a compact, sealed module that can be used in a variety of enclosures suitable for use in any hazardous or corrosive process environment.

3 Discrete Inputs (DI)	Open/Closed valve position feedback
2 Discrete Outputs (DO)	Solenoid outputs for single or double acting
Calibration Switch	Open-Close-Modbus
Status/Warning LEDs	Open, Closed, Alarm State
Short Circuit Protection	Yes
Maximum Current	500mA per output
Maximum Power	12 watts per output
Voltage	11-30 VDC
Diagnostics	
Cycle Counter	Records number of cycles
Cycle Time Alarms	User settable values for Open & Close cycle times
Visual Alarm Indication	Blinking LEDs



SCM-MB Wiring Diagram

The Modbus Sensor-Communications Module fits conveniently into a variety of valve control enclosures suitable for any process environment.

Lumitech DVC-MB
Discrete Valve Controller
- Zone 2 (Class I, Div 2)
- Integral Solenoid Valve
- Direct Mount

See page 130 for more details.

Lumitech DVM-MB
Discrete Valve Monitor
- Zone 2 (Class I, Div 2)
- Direct Mount

See page 132 for more details.

Switchpak DXP-MB
Switchpak DXS-MB (Stainless Steel enclosure)
Discrete Valve Monitor
- Zone 1 (Class I, Div 1)

See page 134, 136 for more details.

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MODBUS Our HazLink products are rugged junction enclosures that provide flexible wiring options in hazardous areas, making it easy to connect conventional devices to the Modbus network as well as make wiring connections and disconnect field devices in hazardous areas.

HazLink Features: Zone 1 (Class I, Div 1)
(3) 3/4" NPT conduit outlets

HazLink Options: I/O Modules
Wiring Tees
Disconnect Switches

Item

HazLink Connectivity Enclosure

<u>General Specifications</u>

Enclosure: Die-cast aluminum; O-ring sealed

Coating: Dichromate conversion (inside); powder polyester coating (outside)

O-rings: Buna N

Cover: Screw cover with O-ring seal

Conduit Outlets: Three 3/4" NPT

Environment: NEMA Type 4, 4X, 7 and 9

Approvals: Explosion Proof
Zone 1
Class I, Div 1 & 2, Groups A,B,C,D
Class II, Div 1 & 2, Groups E,F,G

c UL us LISTED CE

I/O Modules

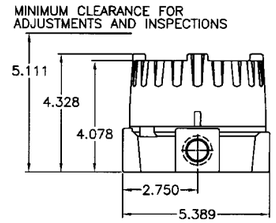
HazLink I/O Modules allow users to cost-effectively connect new or existing conventional devices into the Modbus network in Zone 1 (Class I, Div 1) hazardous areas.

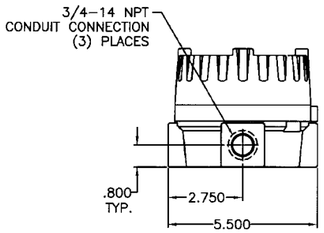
NHL-MBIO Hazlink Connectivity Enclosure with Modbus I/O
2 input, 2 output knifegate valve or cylinder controller

MODBUS

Modbus

Dimensions



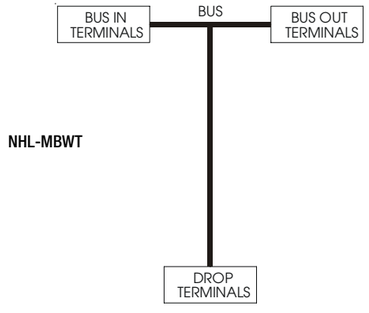


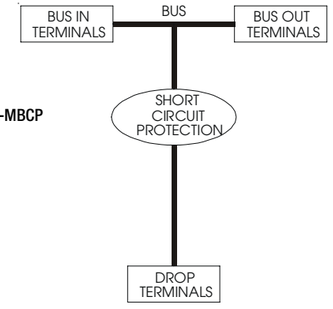
Wiring Tees

HazLink Wiring Tees make it easy to connect field devices to bus lines using wire terminals or plug-in connectors.

NHL-MBWT Modbus tee with 3 x 5 position wiring terminals

NHL-MBCP Short circuit protection





Disconnect Switches

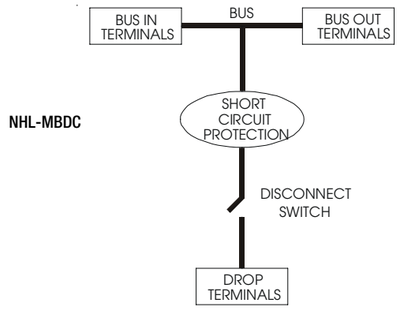
HazLink Disconnect Switches enable users to repair or replace a field device without disturbing the network with the simple flip of a lever-operated switch.

Disconnect Switches are designed to be locked if desired. Locking prevents tampering or accidental device connection or disconnection.

TopWorx offers Disconnect Switches in HazLink enclosures with or without short circuit protection.

NHL-MBDS Disconnect switch

NHL-MBDC Disconnect switch with short circuit protection



AS-i to Modbus Gateways

502.969.8000

MODBUS AS-i to Modbus Gateways control the field devices on the AS-Interface network, and connect the AS-i network to the Modbus protocol via RS 232C, RS 422, or RS 485 serial interface.

General Specifications

Operating Temperature: 32° to 131°F (0° to 55°C)
Voltage of insulation: ≥ 500V
Protection Category: Housing IP40, Terminals IP20

Item	Part Number & Description

AS-i to Modbus Gateways

Gateways function as a master on the AS-i network and as a single node on the Modbus network.

Dual Gateways function as two complete masters on the AS-i network and as a single node on the Modbus network.

These devices include demonstration software that performs addressing, monitoring, and diagnostics of the network.

Additional Specifications

AS-i Specification: 2.1 (Gateways); 2.0 (Dual Gateways)

With AS-i Power Supply

Operating Voltage: 30VDC AS-i voltage

Operating Current:
Single Gateways: 200mA (from AS-i)
Dual Gateways: 200mA (from AS-i 1), 70mA (from AS-i 2)

With Standard Power Supply

Operating Voltage: 24VDC

Operating Current: 70mA (from AS-i), 150mA at 18VDC (from power)

Quick Logic - D-sub-data transmission cords, page 117

Single Gateways

	Serial Interface	Power Supply
NAS-GM11	RS 232C	AS-i
NAS-GM12	RS 232C	Standard
NAS-GM13	RS 485	AS-i
NAS-GM14	RS 485	Standard
NAS-GM15	RS 422	AS-i
NAS-GM16	RS 422	Standard

Dual Gateways

	Serial Interface	Power Supply
NAS-GM21	RS 232C	AS-i
NAS-GM22	RS 232C	Standard
NAS-GM23	RS 485	AS-i
NAS-GM24	RS 485	Standard
NAS-GM25	RS 422	AS-i
NAS-GM26	RS 422	Standard

Modbus to DeviceNet Gateway

TOPWORX

MODBUS The Modbus to DeviceNet Gateway allows the connection of slave devices to a DeviceNet network. The gateway becomes a single node on the DeviceNet network.

General Specifications

Baud Rate Selection: Auto/125k/250k/500k baud
Address Selection: Switch selectable 0-63

Item	Part Number & Description

Modbus to DeviceNet Gateway

The Modbus to DeviceNet allows the connection of Modbus capable slave devices to a DeviceNet network.

The DeviceNet address is set using DIP switches on the device and the DeviceNet baud rate is automatically determined when connected to the network. A single gateway is capable of communicating with one or more Modbus devices.

Additional Specifications

Operating Temperature: 32° to 140°F (0° to 60°C)
Maximum Power: 200mA/11VDC to 90mA/25VDC

NDN-1A02	Modbus to DeviceNet gateway, RS 232 interface

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networx

In addition to protocol-specific power supplies, TopWorx also offers a variety of standard 24VDC power supplies.

Item	Part Number & Description	
24VDC Power Supplies These DIN rail mountable power supplies are compact and economical solutions to 24VDC power requirements.  General Specifications **Protection Class:** NEMA 1; IP20 **Operating Temperature:** 14° to 131°F (-10° to 50°C) **Connection:** 12 AWG, 2.5mm², pluggable	**NXS-1101**	24VDC at 2.5A output
	NXS-1102	24VDC at 6A output
	NXS-1101	24VDC at 6A output, parallel connection with integral diode
	NXS-1101	24VDC at 12A output
	NXS-1101	24VDC at 12A output, parallel connection with integral diode
	NXS-1101	24VDC at 20A output, parallel connection with integral diode
Redundant 24VDC Power Supplies This DIN rail mountable redundant power supply system offers up to 90A at 24VDC or 75A with n+1 redundancy. The chassis can hold either 3 or 6 power modules that provide 15A at 24VDC each.  General Specifications **Input Line Voltage:** 115Vrms nominal, 50-60 Hz **Output Voltage:** 24VDC ± 1%, adjustable from 22.5 to 28V on chassis **Output Current:** 1 to 15A nominal per power module **EMI Compatibility:** EN-50081-2, EN-50082-2 **Operating Temperature:** -13° to 131°F (-25° to 55°C)	**NXS-2101**	24VDC at 45A output, 30A with redundancy
	NXS-2102	24VDC at 90A output, 75A with redundancy

networx

Item	Part Number & Description	
D-sub-data Transmission Cords These connector cords work in conjunction with TopWorx Masters and Gateways to facilitate attachment to a computer for configuration or programming. General Specifications **Connection**: D-sub plug; D-sub socket **Length**: 1.8 m	**NXS-3101**	D-sub data transmission 9-pin cordset
Quick Disconnect Guards Quick Disconnect Guards are designed for the protection of Minifast and Eurofast connectors in Class I, Div. 2 applications. The Guards prevent against mechanical separation of male and female connectors. General Specifications **Material**: Nylon 6 **Operating Temperature:** -22° to 212°F (-30° to 100°C) **Environmental**: Sun resistant, UV stable **Flammability:** UL94 (5=V-0; 4=V-1; 3=V-2; 1=HB)	Standard Shields	
	NXS-4101	Standard minifast shield
	NXS-4102	Standard eurofast shield
	Field Wirable Shields	
	NXS-4103	Field wirable minifast shield
	NXS-4104	Field wirable eurofast shield

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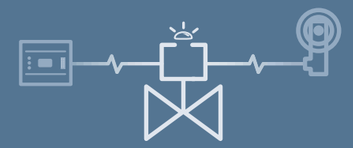


Valve Control Solutions

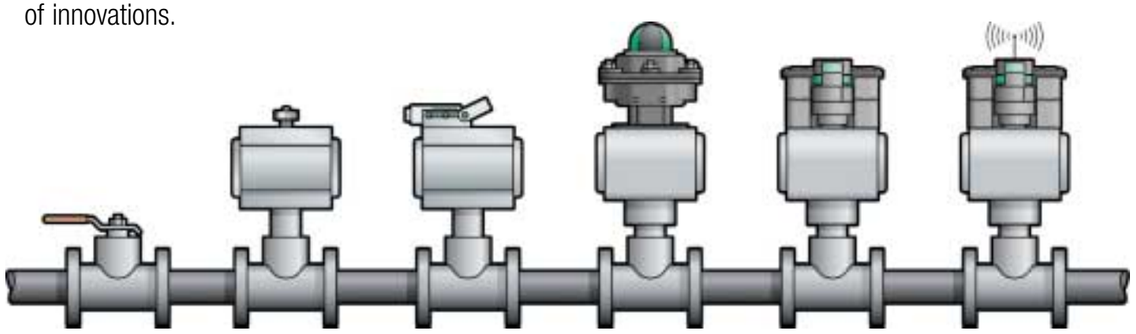
Valve Control 101

The Evolution of Valve Control

Shifts in process control technology drive shifts in valve control technology

During the past century, the methods of controlling plant processes have progressed through several major stages of automation. Each stage has lasted approximately twenty years before being supplanted by a significant shift in technology.

Not surprisingly, the world of on/off valves has followed a similar pattern of technological change. As process control systems have evolved, the on/off valves have followed a corresponding path of innovations.



The Past				Today	The Future
Manual "The old way" Plant operators are required to manually turn valves to proper position	**Pneumatic** The birth of the "automated valve" Pneumatic actuators drive valves open and closed automatically ("Look Ma – no hands!")	**DCS** Advancements in control systems create the need for electrical feedback of valve position provided by limit switches	**PLC** The introduction of the "switchbox" adds visual display of valve position to the electrical feedback and helps reduce wiring costs	**Fieldbus** Reduction in plant personnel and pressure for more productivity leads to adoption of fieldbus process control architectures – and compatible on/off devices	**Wireless** More pressure to reduce capital expenditures and operating costs will introduce wireless field devices ("Look Ma – no wires!")

Today's customer requirements are different

Fundamental shift from conventional switchboxes to digital valve controllers

In the past, when the conventional switchbox was the common method of feedback for on/off valves, engineers did not spend much time specifying the type of limit switchboxes they preferred, instead accepting whatever types the valve or actuator vendor supplied. The result? Process plants around the world are now filled with a variety of types and brands of switchboxes, with little standardization and considerable variability in quality, features, durability, and price.

Today, however, is different. Process plants have increasingly higher goals to be more productive while using fewer people. To accomplish this, plants must place more emphasis on two things: **global product standardization and networking architectures.** The combination of the two delivers substantial results and helps achieve the goals of process plants.

Lumitech DVM

Standardization drives costs down by minimizing operator training and maximizing purchasing power. And fieldbus networking techniques deliver proven economic benefits by shortening commissioning cycles, simplifying wiring, and reducing maintenance costs.

As process plants shift to global product standardization and fieldbus networking, they must be careful to shift their view of vendors as well, particularly when it comes to on/off valves. Gone are the days when engineers at process plants can leave it up to valve and actuator vendors to supply whatever type of limit switchboxes they have in stock.

Instead, as field devices become more sophisticated, process plant engineers must seek out key suppliers that can provide expertise and solutions, not just pricing and product.

Which suppliers can deliver on today's new requirements?

The supplier base of existing switchboxes for on/off valve controllers is highly fragmented and mostly regional. Many of the suppliers are "stuck in switchbox mode." That is, they are adequately adept at designing and manufacturing conventional switchboxes, but they are not ready for the new world of digital valve control.

Digital Valve Control

This new world of digital valve control requires a new set of skills and expertise not found in traditional switchbox suppliers.

Today's process manufactures need switchbox suppliers to demonstrate a solid working knowledge of process control systems and the ability to deliver appropriate, complete solutions anywhere in the world.

To meet new customer requirements and to be truly valuable to end users, a supplier must break away from the old "switchbox mode" and prove clearly that it is capable of true "digital valve control."

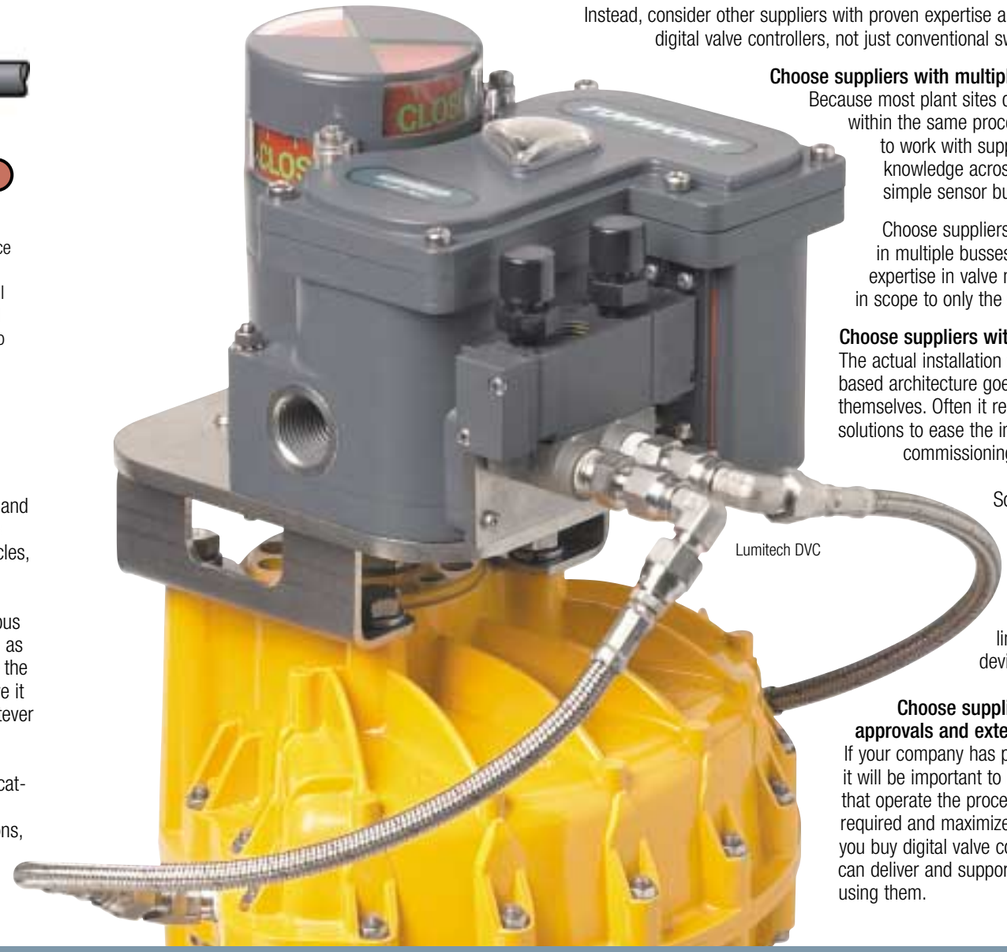
Switchpak DXS

What to look for in a Digital Valve Control supplier

Choose suppliers with deep expertise

If your plant processes are shifting to a fieldbus-based process control system, do not assume that your existing switchbox supplier can deliver the capabilities you'll need for digital valve control. Just because they have been valuable in the past does not guarantee that they have responded well to recent shifts in technology.

Instead, consider other suppliers with proven expertise and experience in providing digital valve controllers, not just conventional switchboxes.



Lumitech DVC

Choose suppliers with multiple busses

Because most plant sites deploy multiple bus protocols within the same process or location, it is helpful to work with suppliers that have a breadth of knowledge across several busses, not just the simple sensor bus networks.

Choose suppliers that have extensive knowledge in multiple busses. Several manufacturers claim expertise in valve networking but are often limited in scope to only the simplest bus protocols.

Choose suppliers with complete solutions

The actual installation of a new process control fieldbus-based architecture goes well beyond the field devices themselves. Often it requires an array of field networking solutions to ease the installation and accelerate the commissioning.

So make sure your supplier of discrete valve controllers has a deep understanding of the process control system and the willingness and capability to take ownership of the critical links between the system and the devices.

Choose suppliers who have global approvals and extensive selection

If your company has plants scattered around the world, it will be important to begin standardizing on products that operate the processes. This minimizes training required and maximizes purchasing power. But before you buy digital valve controllers, make sure the supplier can deliver and support them everywhere you'll be using them.

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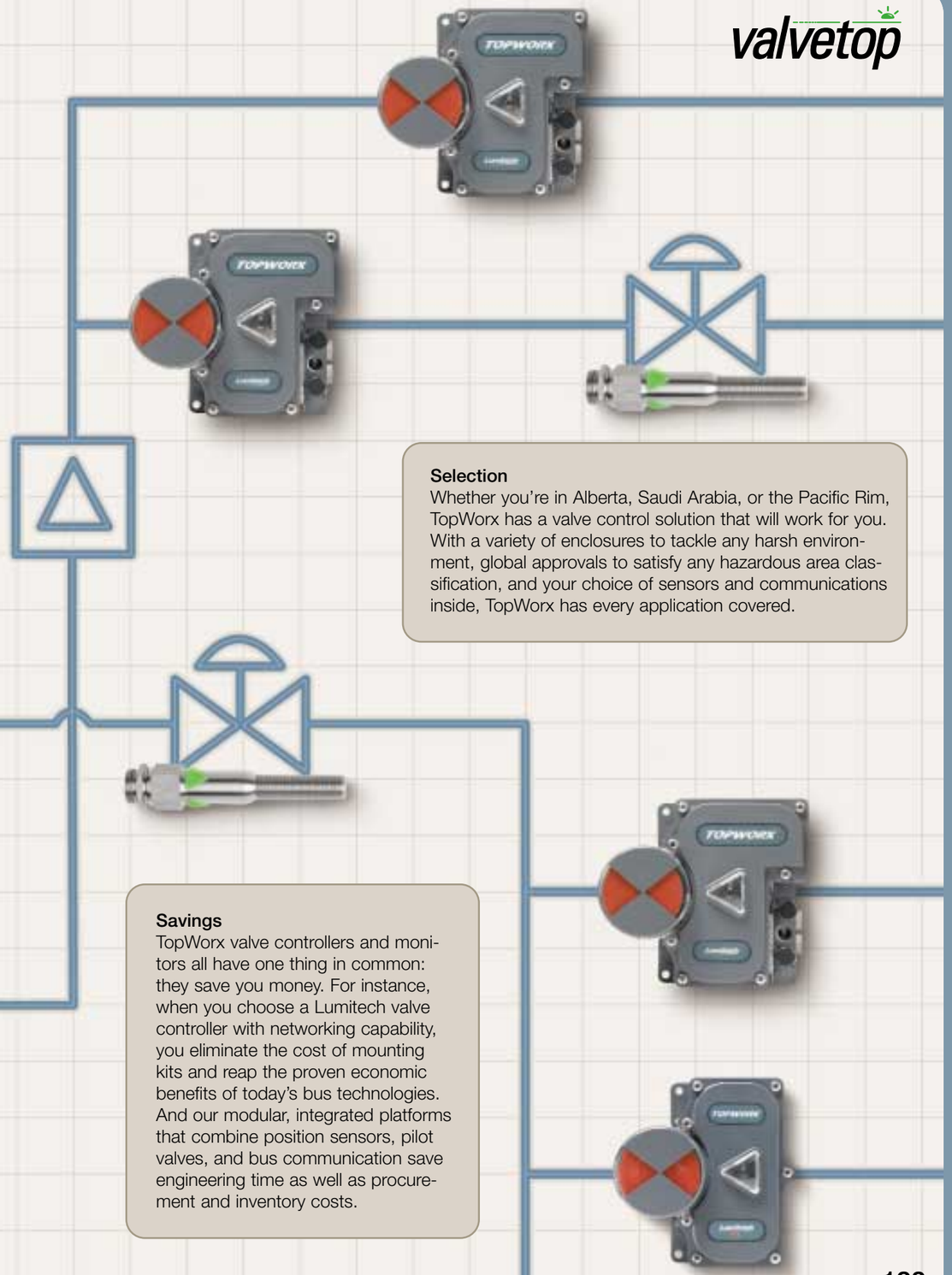
The TopWorx Valve Control Program

TopWorx has listened to customers about the three things that matter most – simplicity, selection, and savings – and combined them into one all-encompassing valve control program.

Simplicity
TopWorx valve controllers and monitors offer unmatched simplicity – they're simple to order, simple to install, and simple to operate. By offering solutions with unique features like potted electronics, direct mounting, LED early warning indicators, and a modular design, TopWorx has ushered in a different way of doing valve control.

Selection
Whether you're in Alberta, Saudi Arabia, or the Pacific Rim, TopWorx has a valve control solution that will work for you. With a variety of enclosures to tackle any harsh environment, global approvals to satisfy any hazardous area classification, and your choice of sensors and communications inside, TopWorx has every application covered.



Savings
TopWorx valve controllers and monitors all have one thing in common: they save you money. For instance, when you choose a Lumitech valve controller with networking capability, you eliminate the cost of mounting kits and reap the proven economic benefits of today's bus technologies. And our modular, integrated platforms that combine position sensors, pilot valves, and bus communication save engineering time as well as procurement and inventory costs.

Did You Know?
TopWorx sensor communication modules for AS-i, FOUNDATION Fieldbus, DeviceNet, Profibus and Modbus can be used in a variety of enclosures suitable for use in any process environment.

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Valve Control Solutions Overview

valvetop

Discrete Valve Controllers

TopWorx discrete valve controllers integrate sensors, bus communications, pilot valve, and termination points into a variety of enclosures, delivering the ultimate in modularity.

Options include

Enclosures
- Lumitech: direct-mount, non-incendive
- Switchpak: explosion-proof

Sensors
- GO Switch leverless limit switches
- Proximity sensors
- Mechanical switches

Bus Communications
- AS-Interface
- FOUNDATION Fieldbus
- DeviceNet
- Profibus DP
- Modbus

Pilot Valves
- Low Power Solenoids
- Ultra Low Power Piezos

Discrete Valve Monitors

TopWorx discrete valve monitors integrate sensors, bus communications, and termination points into a variety of enclosures suitable for any process environment.

Options include

Enclosures
- Lumitech: direct-mount, non-incendive
- Switchpak: explosion-proof

Sensors
- GO Switch leverless limit switches
- Proximity sensors
- Mechanical switches

Bus Communications
- AS-Interface
- FOUNDATION Fieldbus
- DeviceNet
- Profibus DP
- Modbus

Sensor-Communications Modules

TopWorx Sensor-Communications Modules are micro-processor based 'brains' that mount inside Lumitech or Switchpak enclosures to deliver position sensing and bus networking functionality to on/off valves. They combine position sensors, bus communications, solenoid outputs, and wiring terminals into a compact, sealed module that drops into various Lumitech and Switchpak enclosures.

Options include

Enclosures
- Lumitech: direct-mount, non-incendive
- Switchpak: explosion-proof

Sensors
- GO Switch leverless limit switches
- Proximity sensors

Bus Communications
- AS-Interface
- FOUNDATION Fieldbus
- DeviceNet
- Profibus DP
- Modbus

Puck Position Sensors

TopWorx Puck Position Sensors provide reliable valve position monitoring while saving space, time, and money. These devices mount directly to rotary valve actuators and are less than 1/3 the size of conventional switchboxes.

Options include

Sensors
- Proximity sensors

Bus Communications
- AS-Interface

Linear Valve Monitors & Sensors

Backpak valve position monitors are designed specifically for linear valve applications. They use a unique shaftless design to mount snuggly under the bonnet of control valves and are suitable for all hazardous areas.

GO Switch leverless limit switches are the sensor of choice for linear valves around the world. New options like built-in green or red LEDs provide increased plant safety and awareness.

Options

- Backpak explosion-proof enclosures
- GO Switch leverless limit switches

Mounting Kits

The TopWorx VIP bracket program offers the world's largest selection of mounting kits for valve controllers and monitors. After several decades of designing bracket systems for all types of valves and actuators, TopWorx has accumulated over 1,200 different designs.

Options

- Stainless Steel kits
- Custom designs
- Rotary, linear, diaphragm, or knifegate valves

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Valve Control Quick Selection Guide

valvetop

Lumitech DVC
see page 130
Onboard Functionality:
Sensors, Bus, Solenoid, Terminals

Switchpak DXP
see page 134
Onboard Functionality:
Sensors, Bus, Solenoid, Terminals

Lumitech IVC
see page 140
Onboard Functionality:
Sensors, Solenoid, Terminals

Switchpak SXP
see page 148
Onboard Functionality:
Sensors, Solenoid, Terminals

Lumitech DVM
see page 132
Onboard Functionality:
Sensors, Bus, Terminals

Switchpak DXS
see page 136
Onboard Functionality:
Sensors, Bus, Solenoid, Terminals

Lumitech IVM
see page 142
Onboard Functionality:
Sensors, Terminals

Switchpak SXS
see page 150
Onboard Functionality:
Sensors, Solenoid, Terminals

Switchpak SSP
see page 146
Onboard Functionality:
Sensors, Terminals

Switchpak SUP
see page 154
Onboard Functionality:
Sensors, Terminals

Lumitech PPS
see page 144
Onboard Functionality:
Sensors, AS-i, Terminals

Lumitech 7L & LPS
see pages 164, 166
Onboard Functionality:
Sensors, LEDs

Switchpak SRP
see page 152
Onboard Functionality:
Sensors, Terminals

Switchpak SEP
see page 156
Onboard Functionality:
Sensors, Terminals

Switchpak SBP
see page 160
Onboard Functionality:
Sensors, Terminals

GO Switch 73 & 7G
see page 162
Onboard Functionality:
Leverless Limit Switch

Category

AREA CLASSIFICATION

- General Purpose
- Zone 0 Class I, Div 1 Intrinsically Safe
- Zone 1 Class I, Div 1 Explosion Proof
- Zone 2 Class I, Div 2 Non-Incendive

FIELDBUS NETWORK

- AS-i
- Foundation
- DeviceNet
- PROFIBUS
- MODBUS
- GO Switch

Rotary Valve Solutions

Linear Valve Solutions

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Bus Networking Solutions for Rotary Valves

valvetop When it comes to networking automated rotary valves, there is a need for experience and expertise.

With over fifty years experience serving the process industries and proven expertise in multiple bus networks, TopWorx is uniquely positioned to deliver the right solution for any protocol on any valve in any process environment.

Solutions for all rotary valves and actuators:
- Ball valves
- Butterfly valves
- Manual valves
- Dampers
- Rack and pinion actuators
- Scotch yoke actuators
- Vane actuators

Approvals for all hazardous areas:
- Zone 0 intrinsically safe
- Zone 1 explosion proof
- Zone 2 non-incendive

Enclosures for all process environments:
- Engineered resin
- Aluminum
- Stainless steel

Sensor-Communications Modules for all bus networks:
- AS-Interface
- FOUNDATION Fieldbus
- DeviceNet
- Profibus
- Modbus

Other options:
- Integral solenoid valves
- NAMUR and non-NAMUR mounting
- Various visual display dome colors
- BriteLite early warning LEDs

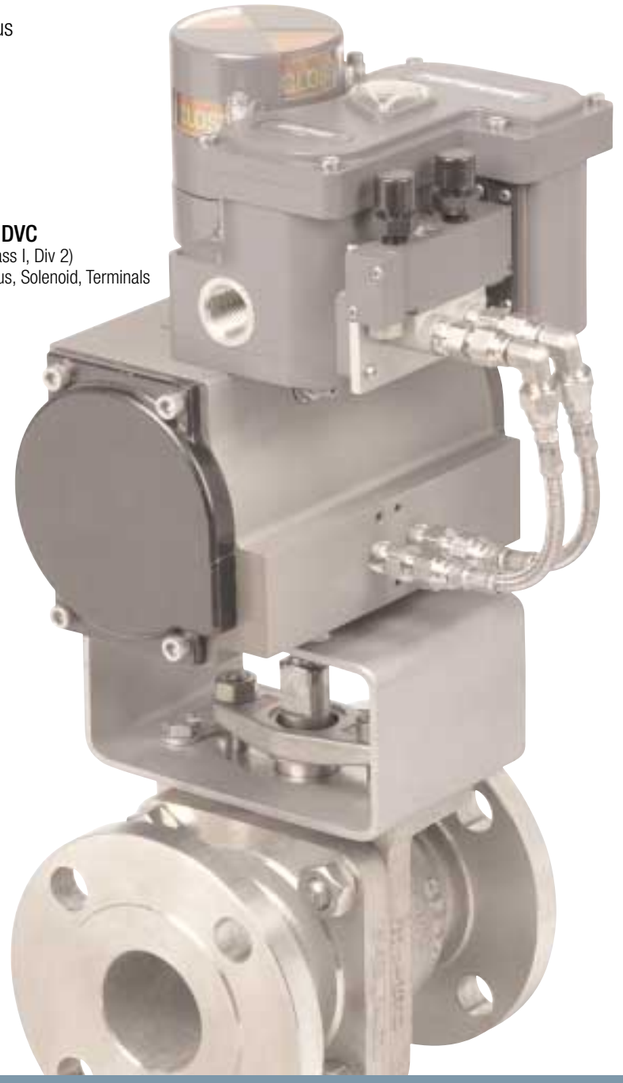
enclosures

Lumitech DVM
- Zone 2 (Class I, Div 2)
- Sensors, Bus, Terminals

Switchpak DXP
- Zone 1 (Class I, Div 1)
- Sensors, Bus, Solenoid, Terminals

Seamless Integration with networx products

Lumitech DVC
- Zone 2 (Class I, Div 2)
- Sensors, Bus, Solenoid, Terminals



Sensor-Communications Module Options

TopWorx SCM's are available in all modern bus protocols in a variety of enclosures suitable for use in any process environment or hazardous area.

Sensor-Communications Module Available in: DVC, DVM, DXP, DXS

Visual Display Options

TopWorx offers several options that provide local feedback of a valve's position.

Lumitech Target Available in: DVC, DVM

Britelite LEDs Available in: DVC, DVM

Switchpak Dome Available in: DXP, DXS

Shaft Options

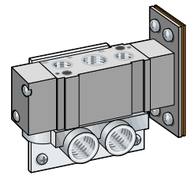
Both Lumitech and Switchpak product lines can mount on any valve actuator, whether it has an ISO/NAMUR mounting pattern or not.

Non-NAMUR Shaft Available in: DXP, DXS

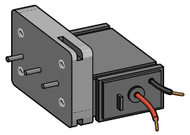
NAMUR Shaft Available in: DXP, DXS

Pilot Valve Options

TopWorx leads the way in providing low power pilot valves suitable for corrosive service and Intrinsically Safe applications.



Solenoid Valve Aluminum or Stainless Steel Available in: DVC, DXP, DXS



Piezo Valve Aluminum or Stainless Steel Available in: DVC, DXP, DXS (FF only)

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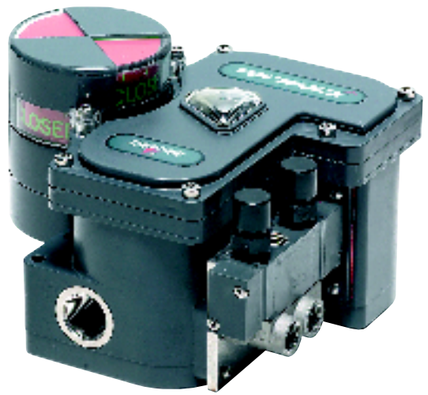
Lumitech DVC

502.969.8000

INTRINSICALLY SAFE • NON-INCENDIVE



DVC: Discrete Valve Controller

The Lumitech DVC has set a new standard in discrete valve control. Feature-rich yet compact and affordable, its design delivers the ultimate combination of modularity and networking capabilities.

Features:
- Integral pilot valve
- Direct mount with no brackets
- BriteLite early warning LEDs
- Zone 0 (Intrinsically Safe, FF)
- Zone 2 (Class I, Div 2)

Options:
- AS-Interface
- FOUNDATION Fieldbus
- DeviceNet
- Profibus DP
- Modbus
- Stainless Steel pilot valve

FAST TRACK DELIVERY

DVC-ASZ2BPS44
AS-Interface
Zone 2 (Class I, Div 2)
4-way solenoid valve

DVC-FFZ0BPP44
FOUNDATION Fieldbus
Zone 0 (Class I, Div 1)
Intrinsically Safe
4-way pilot valve

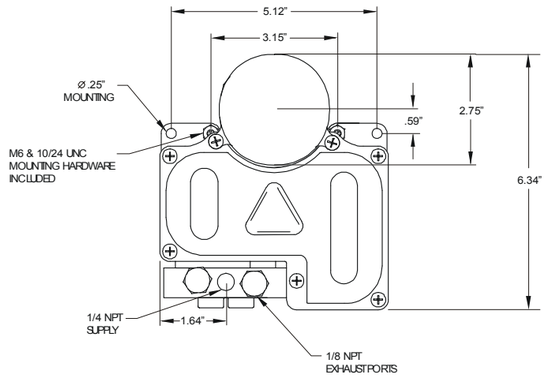
DVC-DNZ2BPS44
DeviceNet
Zone 2 (Class I, Div 2)
4-way solenoid valve

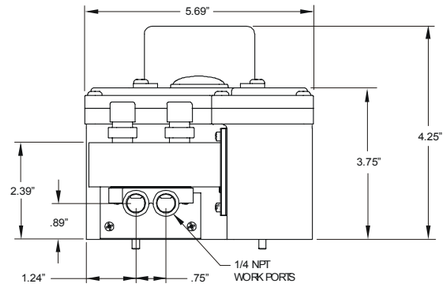
Discrete Valve Control

TOPWORX

Rotary Solutions

Dimensions





Enclosure

Enclosure
Material: PBT blend
Specifications: Flame UL94-0 & UV resistant

Target
Material: PBT blend
Specifications: Flame UL94-V0 & UV resistant
Adjustment: 360° in 3° increments
Dome: Polycarbonate, UV & impact resistant

Conduit Entries: (2) ½" NPT standard; (2) M20 metric optional

Cover Gasket: Silicone; Flame UL94-V0 & UV resistant

Fasteners: All 303 series stainless steel

Mounting
NAMUR: Direct - no brackets or couplers
Non-NAMUR: Interface plate. See page 171.

Temperature Rating: Determined by other components

Environment: NEMA Type 4, 4X; IP66

DVC Discrete Valve Controller

Sensor-Communications Module

AS AS-Interface
(Area Classification must be Z2)
(See page 174 for SCM-ASi specifications)

FF FOUNDATION Fieldbus, standard 2-wire
(See page 176 for SCM-FF specifications)

DN DeviceNet
(Area Classification must be Z2)

DA DeviceNet with analog input
(Area Classification must be Z2)

(See page 175 for SCM-DN specifications)

PB Profibus DP
(Area Classification must be Z2)
(See page 178 for SCM-PB specifications)

MB Modbus
(Area Classification must be Z2)
(See page 179 for SCM-MB specifications)

Area Classification

Z0 Intrinsically Safe
Zone 0
EEx ia IIC
Class I, Div 1 & 2, Groups A,B,C,D
Class II, Div 1 & 2, Groups E,F,G
Class III
(SCM option must be FF)
(Pilot Valve option must be P44 or P45)

Z2 Non-Incendive
Zone 2
EEx nc IIC
Class I, Div 2, Groups A,B,C,D
Class II, Div 2, Groups E,F,G
Class III

May be installed Intrinsically Safe per NEC Article 504 and with entity approved barrier.

Install as Non-Incendive per NEC Article 501.

Visual Display

Target Colors: Green and Red

BriteLite Colors: Green and Red

BriteLite Lens: Polycarbonate, UV resistant

B Dome and BriteLite (90° Green/Red)

N Dome only (90° Green/Red)

Consult factory for additional color and rotation options.

Wiring

P ½" NPT conduit

M M20 metric conduit (includes adapter fitting)

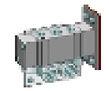
1 Mini-change quick disconnect

3 Euro-change quick disconnect

5 AS-i flat cable adapter
(SCM option must be AS)
(Not rated for hazardous locations)

For Zone 2 (Class 1, Div 2) applications of Wiring options 1 & 3, see page 117 for quick disconnect guards.

Pilot Valve


Solenoid Valve


Piezo Valve

S44 Solenoid valve with 24VDC, 1.2 Cv, 0.6 watt, aluminum, 4-way
(not available with FF SCM option)

S45 Solenoid valve with 24VDC, 1.2 Cv, 0.6 watt, stainless steel, 4-way
(not available with FF SCM option)

P44 Piezo valve with 1.2 Cv, 0.005 watt, aluminum, 4-way
(SCM option must be FF)

P45 Piezo valve with 1.2 Cv, 0.005 watt, stainless steel, 4-way
(SCM option must be FF)

Dirt Target — Filtered air is required for proper valve operation. See our Air Filter on page 170.

Ordering Guide

Fill in the boxes to create your 'ordering number.'

Enclosure		Sensor-Communications Module		Area Classification		Visual Display		Wiring		Pilot Valve
DVC	-									

Lumitech DVM

502.969.8000

INTRINSICALLY SAFE • NON-INCENDIVE

DVM: Discrete Valve Monitor

The Lumitech DVM offers the same functionality as the DVC, less the onboard pilot valve. The DVM is the best choice for customers who prefer a specific brand of solenoid, which can be wired directly to the spare terminals in the DVM.

Features:
- Terminals to wire in external solenoid
- Direct mount with no brackets
- BriteLite early warning LEDs
- Zone 0 (Intrinsically Safe, FF)
- Zone 2 (Class I, Div 2)

Options:
- AS-Interface
- FOUNDATION Fieldbus
- DeviceNet
- Profibus DP
- Modbus

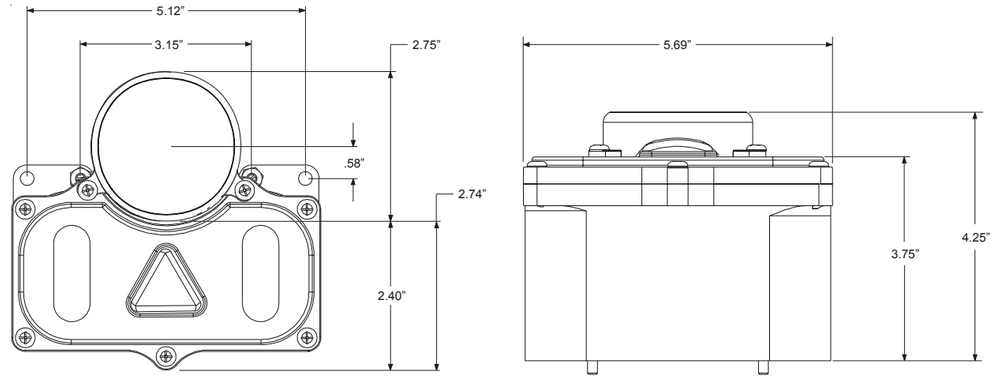
FAST TRACK DELIVERY

DVM-ASZ2BP
AS-Interface
Zone 2 (Class I, Div 2)
Dome & BriteLite

DVM-FFZ0BP
FOUNDATION Fieldbus
Zone 2 (Class I, Div 1)
Dome & BriteLite

DVM-DNZ2BP
DeviceNet
Zone 2 (Class I, Div 2)
Dome & BriteLite

Dimensions



Enclosure

Enclosure
Material: PBT blend
Specifications: Flame UL94-0 & UV resistant

Target
Material: PBT blend
Specifications: Flame UL94-V0 & UV resistant
Adjustment: 360° in 3° increments
Dome: Polycarbonate, UV & impact resistant

Conduit Entries: (2) ½" NPT standard; (2) M20 metric optional

Cover Gasket: Silicone; Flame UL94-V0 & UV resistant

Fasteners: All 303 series stainless steel

Mounting
NAMUR: Direct - no brackets or couplers
Non-NAMUR: Interface plate. See page 171.

Temperature Rating: Determined by other components

Environment: NEMA Type 4, 4X; IP66

DVM Discrete Valve Monitor

Sensor-Communications Module

AS AS-Interface
(Area Classification must be Z2)
(See page 174 for SCM-ASi specifications)

FF FOUNDATION Fieldbus, standard 2-wire
(See page 176 for SCM-FF specifications)

With FF Cube option, a TopWorx bolt-on or NAMUR mount pilot valve is required. See page 177 for model numbers.

DN DeviceNet
(Area Classification must be Z2)

DA DeviceNet with analog input
(Area Classification must be Z2)

(See page 175 for SCM-DN specifications)

PB Profibus DP
(Area Classification must be Z2)
(See page 175 for SCM-PB specifications)

MB Modbus
(Area Classification must be Z2)
(See page 179 for SCM-MB specifications)

Area Classification

Z0 Intrinsically Safe
Zone 0
EEx ia IIc
Class I, Div 1 & 2, Groups A,B,C,D
Class II, Div 1 & 2, Groups E,F,G
Class III
(SCM option must be FF)

Z2 Non-Incendive
Zone 2
EEx nc IIc
Class I, Div 2, Groups A,B,C,D
Class II, Div 2, Groups E,F,G
Class III

May be installed Intrinsically Safe per NEC Article 504 and with entity approved barrier.

Install as Non-Incendive per NEC Article 501.

Visual Display

Target Colors: Green and Red

BriteLite Colors: Green and Red

BriteLite Lens: Polycarbonate, UV resistant

B Dome and BriteLite (90° Green/Red)

N Dome only (90° Green/Red)

Consult factory for additional color and rotation options.

Wiring

P ½" NPT conduit

M M20 metric conduit (includes adapter fitting)

1 Mini-change quick disconnect

3 Euro-change quick disconnect

5 AS-i flat cable adapter
(Cube option must be AS)
(Not rated for hazardous locations)

For Zone 2 (Class 1, Div 2) applications of Wiring options 1 & 3, see page 117 for quick disconnect guards.

Ordering Guide

Fill in the boxes to create your 'ordering number.'

Enclosure		Sensor-Communications Module	Area Classification	Visual Display	Wiring
DVM	-				

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Switchpak DXP

502.969.8000

EXPLOSION PROOF • INTRINSICALLY SAFE

Switchpak DXP

The Switchpak DXP combines sensors, bus communication, and a solenoid valve into an aluminum Zone 1 (Class I, Div 1) enclosure.

Features: Zone 0 (Intrinsically Safe, FF)
Zone 1 (Class I, Div 1)
Aluminum enclosure

Options: AS-Interface
FOUNDATION Fieldbus
DeviceNet
Profibus DP
Modbus

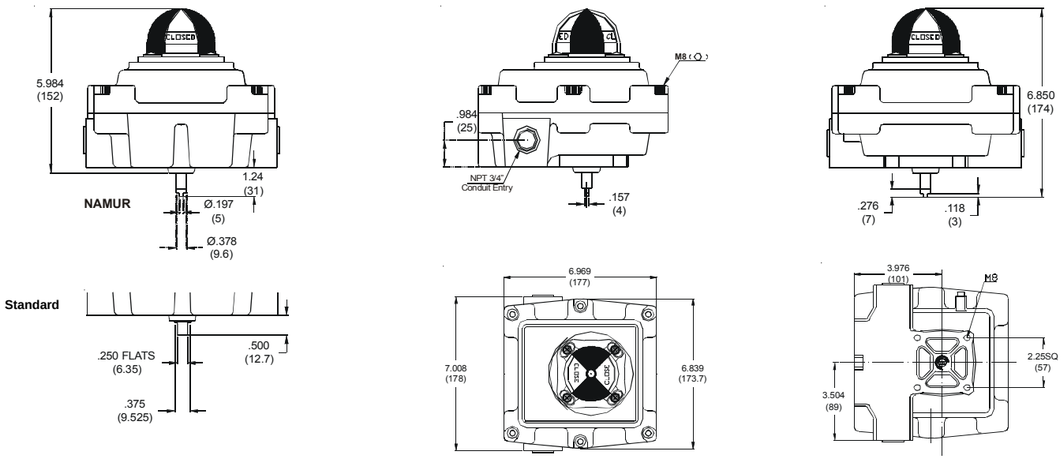
FAST TRACK DELIVERY

DXP-ASZ1GR□S84
AS-Interface
Zone 1 (Class I, Div 1)
4-way solenoid
Aluminum enclosure

DXP-DNZ1GR□S84
DeviceNet
Zone 1 (Class I, Div 1)
4-way solenoid
Aluminum enclosure

□ For Shaft, choose S or N (both in stock)

Dimensions



Enclosure

Enclosure: Die-cast aluminum; O-ring sealed

Coating: Dichromate conversion or anodize inside; powder polyester coating outside

O-rings: Buna N; Viton optional

Cover Bolts: 6 captive socket head stainless steel screws

Conduit Entries: Two 3/4" NPT (Four optional)

Terminal Strip Contacts: Located on SCM

Temperature Rating: Determined by other components

Environment: NEMA Type 4, 4X, 7, 9; IP66

DXP Switchpak DXP

Sensor-Communications Module

AS AS-Interface
(Area Classification must be Z1)
(See page 174 for SCM-ASi specifications)

FF FOUNDATION Fieldbus, standard 2-wire
(See page 176 for SCM-FF specifications)

DN DeviceNet
(Area Classification must be Z1)

DA DeviceNet with analog input
(Area Classification must be Z1)

(See page 175 for SCM-DN specifications)

PB Profibus DP
(Area Classification must be Z1)
(See page 178 for SCM-PB specifications)

MB Modbus
(Area Classification must be Z1)
(See page 179 for SCM-MB specifications)

Area Classification

Z0 Intrinsically Safe
Zone 0
EEx ia IIC
Class I, Div 1 & 2, Groups A,B,C,D
Class II, Div 1 & 2, Groups E,F,G
Class III
(SCM option must be FF)
(Pilot Valve option must be P84 or P85)

Z1 Explosion Proof/Flame Proof
Zone 1
EEx d IIB
Class I, Div 1 & 2, Groups C,D
Class II, Div 1 & 2, Groups F,G
Class III

May be installed Intrinsically Safe per NEC Article 504 and with entity approved barrier.

Visual Display

Visual Display: Impact resistant polycarbonate; O-ring sealed; 360° adjustable; bolt-on

GR Green/Red indicator dome, 90°

BY Black/Yellow indicator dome, 90°

TD 120° through divert indicator dome

Shaft

Standard NAMUR

Shaft: Stainless steel; O-ring sealed

Shaft Retainer: Stainless steel

N NAMUR shaft

S Standard 1/4" flat shaft

Pilot Valve

Solenoid Valve Piezo Valve

000 No pneumatic valve

S84 24VDC, aluminum, 4-way
(not available with FF SCM)

S85 24VDC, stainless steel, 4-way
(not available with FF SCM)

P84 Piezo pilot, aluminum, 4-way
(SCM option must be FF)

P85 Piezo pilot, stainless steel, 4-way
(SCM option must be FF)

Don't forget! Filtered air is required for proper valve operation. See our Air Filter on page 170.

Ordering Guide

Fill in the boxes to create your 'ordering number.'

Enclosure: DXP - Sensor-Communications Module | Area Classification | Visual Display | Shaft | Pilot Valve

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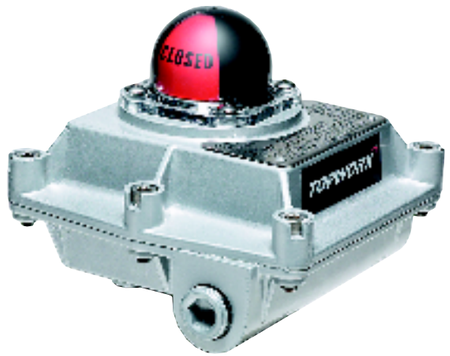
Switchpak DXS

502.969.8000

EXPLOSION PROOF • INTRINSICALLY SAFE



Switchpak DXS

The Switchpak DXS combines sensors, bus communication, and a solenoid valve into a stainless steel Zone 1 (Class I, Div 1) enclosure.

Features: Zone 0 (Intrinsically Safe, FF)
Zone 1 (Class I, Div 1)
Stainless Steel enclosure

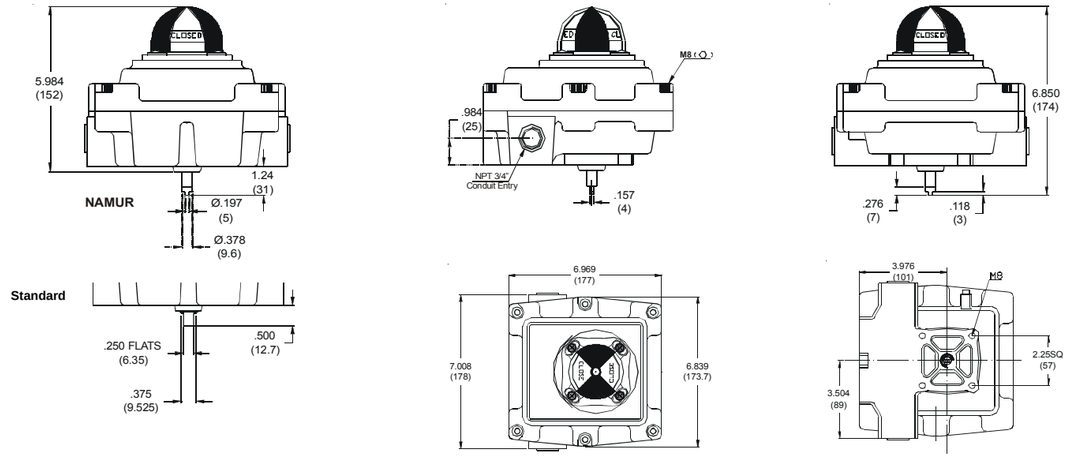
Options: AS-Interface
FOUNDATION Fieldbus
DeviceNet
Profibus DP
Modbus

Discrete Valve Control

TOPWORX

Rotary Solutions

Dimensions



Enclosure

Enclosure: Stainless steel; O-ring sealed

Coating: Powder polyester outside

O-rings: Buna N; Viton optional

Cover Bolts: 6 captive socket head stainless steel screws

Conduit Entries: Two 3/4" NPT (Four optional)

Terminal Strip Contacts: Located on SCM

Temperature Rating: Determined by other components

Environment: NEMA Type 4, 4X, 7, 9; IP66

DXS Switchpak DXS

Sensor-Communications Module

AS AS-Interface
(Area Classification must be Z1)
(See page 174 for SCM-ASi specifications)

FF FOUNDATION Fieldbus, standard 2-wire
(See page176 for SCM-FF specifications)

DN DeviceNet
(Area Classification must be Z1)

DA DeviceNet with analog input
(Area Classification must be Z1)

(See page 175 for SCM-DN specifications)

PB Profibus DP
(Area Classification must be Z1)
(See page 178 for SCM-PB specifications)

MB Modbus
(Area Classification must be Z1)
(See page 179 for SCM-MB specifications)

Area Classification

Z0 Intrinsically Safe
Zone 0
EEx ia IIC
Class I, Div 1 & 2, Groups A,B,C,D
Class II, Div 1 & 2, Groups E,F,G
Class III
(SCM option must be FF)
(Pilot Valve option must be P84 or P85)

Z1 Explosion Proof/Flame Proof
Zone 1
EEx d IIB
Class I, Div 1 & 2, Groups C,D
Class II, Div 1 & 2, Groups F,G
Class III

May be installed Intrinsically Safe per NEC Article 504 and with entity approved barrier.

Visual Display

Visual Display: Impact resistant polycarbonate; O-ring sealed; 360° adjustable; bolt-on

GR Green/Red indicator dome

BY Black/Yellow indicator dome

TD 120° through divert indicator dome

Shaft

Shaft: Stainless steel; O-ring sealed

Shaft Retainer: Stainless steel

N NAMUR shaft

S Standard 1/4" flat shaft

Pilot Valve

000 No pneumatic valve

S84 24VDC, aluminum, 4-way
(not available with FF SCM)

S85 24VDC, stainless steel, 4-way
(not available with FF SCM)

P84 Piezo pilot, aluminum, 4-way
(SCM option must be FF)

P85 Piezo pilot, stainless steel, 4-way
(SCM option must be FF)

Don't forget! Filtered air is required for proper valve operation. See our Air Filter on page 170.

Ordering Guide

Fill in the boxes to create your 'ordering number.'

Enclosure		Sensor-Communications Module	Area Classification	Visual Display	Shaft	Pilot Valve
DXS	-					

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Switchpak DXP

502.969.8000

EXPLOSION PROOF • INTRINSICALLY SAFE

Switchpak DXP

The Switchpak DXP combines sensors, bus communication, and a solenoid valve into an aluminum Zone 1 (Class I, Div 1) enclosure.

Features: Zone 0 (Intrinsically Safe, FF)
Zone 1 (Class I, Div 1)
Aluminum enclosure

Options: AS-Interface
FOUNDATION Fieldbus
DeviceNet
Profibus DP
Modbus

FAST TRACK DELIVERY

DXP-ASZ1GR□S84
AS-Interface
Zone 1 (Class I, Div 1)
4-way solenoid
Aluminum enclosure

DXP-DNZ1GR□S84
DeviceNet
Zone 1 (Class I, Div 1)
4-way solenoid
Aluminum enclosure

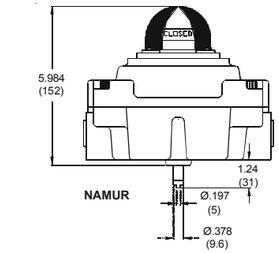
□ For Shaft, choose S or N (both in stock)

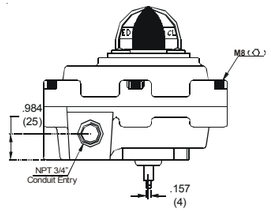
Discrete Valve Control

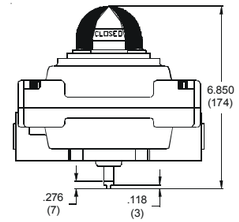
TOPWORX

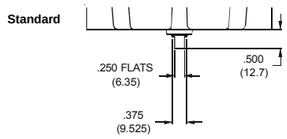
Rotary Solutions

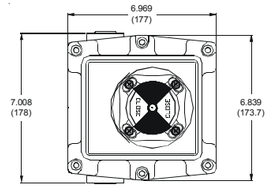
Dimensions

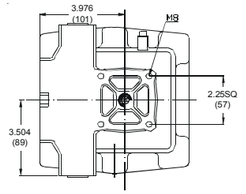












Enclosure

Enclosure: Die-cast aluminum; O-ring sealed

Coating: Dichromate conversion or anodize inside; powder polyester coating outside

O-rings: Buna N; Viton optional

Cover Bolts: 6 captive socket head stainless steel screws

Conduit Entries: Two 3/4" NPT (Four optional)

Terminal Strip Contacts: Located on SCM

Temperature Rating: Determined by other components

Environment: NEMA Type 4, 4X, 7, 9; IP66

DXP Switchpak DXP

Sensor-Communications Module

AS AS-Interface
(Area Classification must be Z1)
(See page 174 for SCM-ASi specifications)

FF FOUNDATION Fieldbus, standard 2-wire
(See page 176 for SCM-FF specifications)

DN DeviceNet
(Area Classification must be Z1)

DA DeviceNet with analog input
(Area Classification must be Z1)

(See page 175 for SCM-DN specifications)

PB Profibus DP
(Area Classification must be Z1)
(See page 178 for SCM-PB specifications)

MB Modbus
(Area Classification must be Z1)
(See page 179 for SCM-MB specifications)

Area Classification

Z0 Intrinsically Safe
Zone 0
EEx ia IIC
Class I, Div 1 & 2, Groups A,B,C,D
Class II, Div 1 & 2, Groups E,F,G
Class III
(SCM option must be FF)
(Pilot Valve option must be P84 or P85)

Z1 Explosion Proof/Flame Proof
Zone 1
EEx d IIB
Class I, Div 1 & 2, Groups A,B,C,D
Class II, Div 1 & 2, Groups E,F,G
Class III

May be installed Intrinsically Safe per NEC Article 504 and with entity approved barrier.

Visual Display

Visual Display: Impact resistant polycarbonate; O-ring sealed; 360° adjustable; bolt-on

GR Green/Red indicator dome, 90°

BY Black/Yellow indicator dome, 90°

TD 120° through divert indicator dome

Shaft

Shaft: Stainless steel; O-ring sealed

Shaft Retainer: Stainless steel

N NAMUR shaft

S Standard 1/4" flat shaft

Pilot Valve

000 No pneumatic valve

S84 24VDC, aluminum, 4-way
(not available with FF SCM)

S85 24VDC, stainless steel, 4-way
(not available with FF SCM)

P84 Piezo pilot, aluminum, 4-way
(SCM option must be FF)

P85 Piezo pilot, stainless steel, 4-way
(SCM option must be FF)

Filtered air is required for proper valve operation. See our Air Filter on page 170.

Ordering Guide

Fill in the boxes to create your 'ordering number.'

Enclosure		Sensor-Communications Module		Area Classification		Visual Display		Shaft		Pilot Valve
DXP	-									

Courtesy of Steven Engineering, Inc. • 230 Ryan Way, South San Francisco, CA 94080-6370 • Main Office: (650) 588-9200 • Outside Local Area: (800) 258-9200 • www.stevenengineering.com

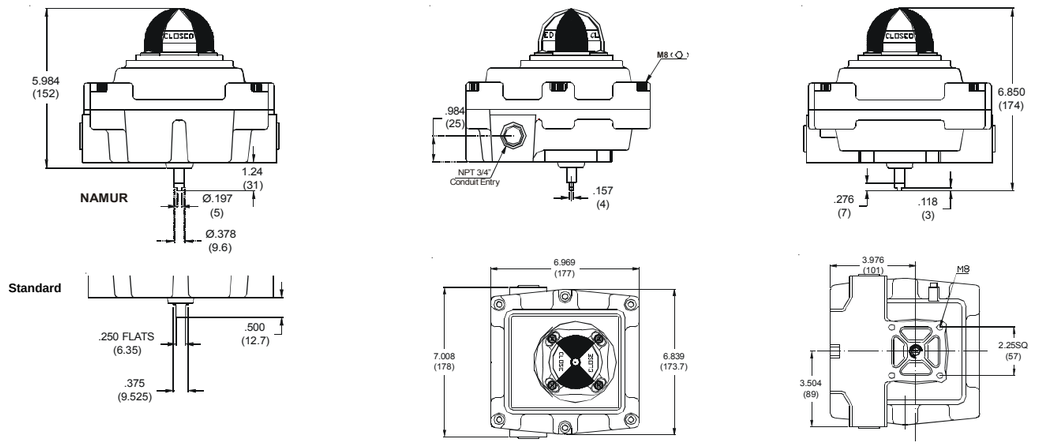
Switchpak DXS

The Switchpak DXS combines sensors, bus communication, and a solenoid valve into a stainless steel Zone 1 (Class I, Div 1) enclosure.

Features: Zone 0 (Intrinsically Safe, FF)
Zone 1 (Class I, Div 1)
Stainless Steel enclosure

Options: AS-Interface
FOUNDATION Fieldbus
DeviceNet
Profibus DP
Modbus

Dimensions



Enclosure

Enclosure: Stainless steel; O-ring sealed

Coating: Powder polyester outside

O-rings: Buna N; Viton optional

Cover Bolts: 6 captive socket head stainless steel screws

Conduit Entries: Two 3/4" NPT (Four optional)

Terminal Strip Contacts: Located on SCM

Temperature Rating: Determined by other components

Environment: NEMA Type 4, 4X, 7, 9; IP66

DXS Switchpak DXS

Sensor-Communications Module

AS AS-Interface
(Area Classification must be Z1)
(See page 174 for SCM-ASi specifications)

FF FOUNDATION Fieldbus, standard 2-wire
(See page176 for SCM-FF specifications)

DN DeviceNet
(Area Classification must be Z1)

DA DeviceNet with analog input
(Area Classification must be Z1)

(See page 175 for SCM-DN specifications)

PB Profibus DP
(Area Classification must be Z1)
(See page 178 for SCM-PB specifications)

MB Modbus
(Area Classification must be Z1)
(See page 179 for SCM-MB specifications)

Area Classification

Z0 Intrinsically Safe
Zone 0
EEx ia IIC
Class I, Div 1 & 2, Groups A,B,C,D
Class II, Div 1 & 2, Groups E,F,G
Class III
(SCM option must be FF)
(Pilot Valve option must be P84 or P85)

Z1 Explosion Proof/Flame Proof
Zone 1
EEx d IIB
Class I, Div 1 & 2, Groups A,B,C,D
Class II, Div 1 & 2, Groups E,F,G
Class III

May be installed Intrinsically Safe per NEC Article 504 and with entity approved barrier.

Visual Display

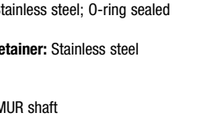
Visual Display: Impact resistant polycarbonate; O-ring sealed; 360° adjustable; bolt-on

GR Green/Red indicator dome

BY Black/Yellow indicator dome

TD 120° through divert indicator dome

Shaft



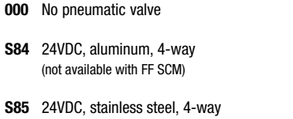
Shaft: Stainless steel; O-ring sealed

Shaft Retainer: Stainless steel

N NAMUR shaft

S Standard 1/4" flat shaft

Pilot Valve



000 No pneumatic valve

S84 24VDC, aluminum, 4-way
(not available with FF SCM)

S85 24VDC, stainless steel, 4-way
(not available with FF SCM)

P84 Piezo pilot, aluminum, 4-way
(SCM option must be FF)

P85 Piezo pilot, stainless steel, 4-way
(SCM option must be FF)

Don't forget! Filtered air is required for proper valve operation. See our Air Filter on page 170.

Ordering Guide

Fill in the boxes to create your 'ordering number.'

Enclosure		Sensor-Communications Module	Area Classification	Visual Display	Shaft	Pilot Valve
DXS	-					

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Conventional Solutions for Rotary Valves

valvetop When it comes to topworks for automated rotary valves, there is a need for selection, simplicity, and savings.

With a large selection of modular enclosures and a variety of options that deliver the ultimate in simplicity, TopWorx is sure to have a solution that can generate big savings for you.

Solutions for all rotary valves and actuators:
- Ball valves
- Butterfly valves
- Manual valves
- Dampers
- Rack and pinion actuators
- Scotch yoke actuators
- Vane actuators

Approvals for all hazardous areas:
- Zone 0 intrinsically safe
- Zone 1 explosion proof
- Zone 2 non-incendive

Enclosures for all process environments:
- Engineered resin
- Aluminum
- Stainless steel
- Severe service
- Corrosive atmospheres
- High temperature
- Low temperature
- Heavy washdown
- Sanitary
- Salt water spray
- Underwater

Sensors for all applications:
- GO Switch leverless limit switches
- Potted sensor modules
- Mechanical limit switches
- Proximity sensors
- 4-20mA position transmitters
- 0-1k & 0-10k potentiometers

Other options:
- Integral solenoid valves
- NAMUR and non-NAMUR mounting
- Various visual display dome colors
- BriteLite early warning LEDs

enclosures

Lumitech IVC
- Non-Incendive
- Integral Solenoid Valve

Lumitech IVM
- Non-Incendive

Switchpak SXP
- Explosion Proof

Switchpak SUP
- General Purpose NAMUR

Lumitech PPS
- General Purpose Direct Mount

Switchpak SXS
- Stainless Steel

Switchpak SSP
- Explosion Proof

Switchpak SRP
- Non-Incendive

Switchpak SEP
- General Purpose Non-NAMUR

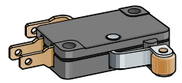
Sensor Options

TopWorx provides a variety of sensor options to cover all process applications.

Of course, the GO Switch leverless limit switch stands above all others!

35 Series GO Switches
IVC, IVM, SXP, SXS, SSP, SRP

Potted Sensor Module
IVC, IVM, SXP, SXS



Mechanical SPDT
SXP, SXS, SSP, SRP, SEP, SUP

Mechanical DPDT
SXP, SXS, SSP, SRP, SEP

Proximity SPDT, SPST
SSP, SRP, SEP, SUP

Pepperl + Fuchs Proximity
SXP, SXS, SUP

Visual Display Options

TopWorx offers several options that provide local feedback of a valve's position.

Lumitech Target
Available in:
IVC, IVM

Britelite LEDs
Available in:
IVC, IVM

Switchpak Dome
Available in:
SXP, SXS

Switchpak Dome
Available in:
SSP, SRP, SEP, SUP

Shaft Options

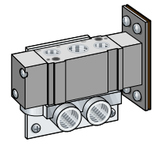
Both Lumitech and Switchpak product lines can mount on any valve actuator, whether it has an ISO/NAMUR mounting pattern or not.

Non-NAMUR Shaft
Available in:
SXP, SXS, SSP, SRP, SEP

NAMUR Shaft
Available in:
SXP, SXS, SSP, SRP, SUP, SEP

Solenoid Valve Options

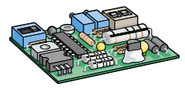
TopWorx leads the way in providing low power pilot valves suitable for corrosive service and Intrinsically Safe applications.



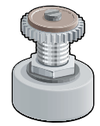
Solenoid Valve
Aluminum or Stainless Steel
Available in:
IVC, SXP, SXS

Analog Output Options

TopWorx analog output options provide continuous valve position feedback.



4-20mA Transmitter
Available in:
SXP, SXS, SSP, SRP



Potentiometer
Available in:
SXP, SXS, SSP, SRP

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Lumitech DVM

502.969.8000

INTRINSICALLY SAFE • NON-INCENDIVE

DVM: Discrete Valve Monitor

The Lumitech DVM offers the same functionality as the DVC, less the onboard pilot valve. The DVM is the best choice for customers who prefer a specific brand of solenoid, which can be wired directly to the spare terminals in the DVM.

Features: Terminals to wire in external solenoid
Direct mount with no brackets
BriteLite early warning LEDs
Zone 0 (Intrinsically Safe, FF)
Zone 2 (Class I, Div 2)

Options: AS-Interface
FOUNDATION Fieldbus
DeviceNet
Profibus DP
Modbus

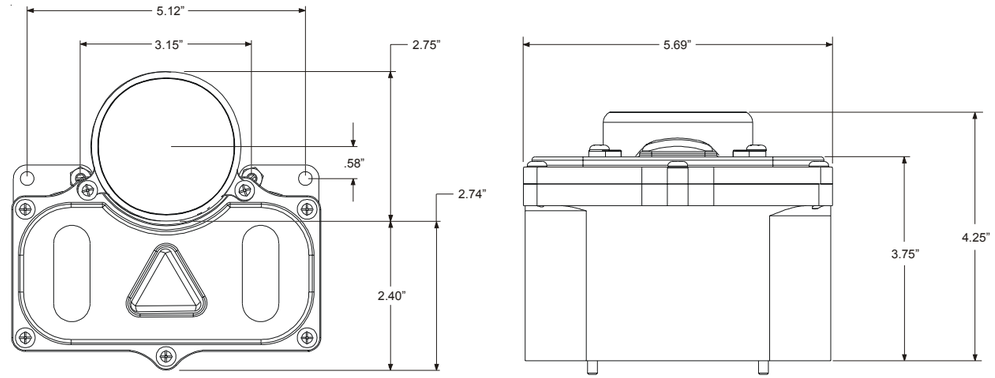
FAST TRACK DELIVERY

DVM-ASZ2BP
AS-Interface
Zone 2 (Class I, Div 2)
Dome & BriteLite

DVM-FFZ0BP
FOUNDATION Fieldbus
Zone 2 (Class I, Div 1)
Dome & BriteLite

DVM-DNZ2BP
DeviceNet
Zone 2 (Class I, Div 2)
Dome & BriteLite

Dimensions



Enclosure

Enclosure
Material: PBT blend
Specifications: Flame UL94-0 & UV resistant

Target
Material: PBT blend
Specifications: Flame UL94-V0 & UV resistant
Adjustment: 360° in 3° increments
Dome: Polycarbonate, UV & impact resistant

Conduit Entries: (2) ½" NPT standard; (2) M20 metric optional

Cover Gasket: Silicone; Flame UL94-V0 & UV resistant

Fasteners: All 303 series stainless steel

Mounting
NAMUR: Direct - no brackets or couplers
Non-NAMUR: Interface plate. See page 171.

Temperature Rating: Determined by other components

Environment: NEMA Type 4, 4X; IP66

DVM Discrete Valve Monitor

Sensor-Communications Module

AS AS-Interface
(Area Classification must be Z2)
(See page 174 for SCM-ASi specifications)

FF FOUNDATION Fieldbus, standard 2-wire
(See page 176 for SCM-FF specifications)

With FF Cube option, a TopWorx bolt-on or NAMUR mount pilot valve is required. See page 177 for model numbers.

DN DeviceNet
(Area Classification must be Z2)

DA DeviceNet with analog input
(Area Classification must be Z2)

(See page 175 for SCM-DN specifications)

PB Profibus DP
(Area Classification must be Z2)
(See page 175 for SCM-PB specifications)

MB Modbus
(Area Classification must be Z2)
(See page 179 for SCM-MB specifications)

Area Classification

Z0 Intrinsically Safe
Zone 0
EEx ia IIc
Class I, Div 1 & 2, Groups A,B,C,D
Class II, Div 1 & 2, Groups E,F,G
Class III
(SCM option must be FF)

Z2 Non-Incendive
Zone 2
EEx nc IIc
Class I, Div 2, Groups A,B,C,D
Class II, Div 2, Groups E,F,G
Class III

May be installed Intrinsically Safe per NEC Article 504 and with entity approved barrier.

Install as Non-Incendive per NEC Article 501.

Visual Display

Target Colors: Green and Red

BriteLite Colors: Green and Red

BriteLite Lens: Polycarbonate, UV resistant

B Dome and BriteLite (90° Green/Red)

N Dome only (90° Green/Red)

Consult factory for additional color and rotation options.

Wiring

P ½" NPT conduit

M M20 metric conduit (includes adapter fitting)

1 Mini-change quick disconnect

3 Euro-change quick disconnect

5 AS-i flat cable adapter
(Cube option must be AS)
(Not rated for hazardous locations)

For Zone 2 (Class 1, Div 2) applications of Wiring options 1 & 3, see page 117 for quick disconnect guards.

Ordering Guide

Fill in the boxes to create your 'ordering number.'

Enclosure		Sensor-Communications Module	Area Classification	Visual Display	Wiring
DVM	-				

Lumitech DVC

502.969.8000

INTRINSICALLY SAFE • NON-INCENDIVE

DVC: Discrete Valve Controller

The Lumitech DVC has set a new standard in discrete valve control. Feature-rich yet compact and affordable, its design delivers the ultimate combination of modularity and networking capabilities.

Features:
- Integral pilot valve
- Direct mount with no brackets
- BriteLite early warning LEDs
- Zone 0 (Intrinsically Safe, FF)
- Zone 2 (Class I, Div 2)

Options:
- AS-Interface
- FOUNDATION Fieldbus
- DeviceNet
- Profibus DP
- Modbus
- Stainless Steel pilot valve

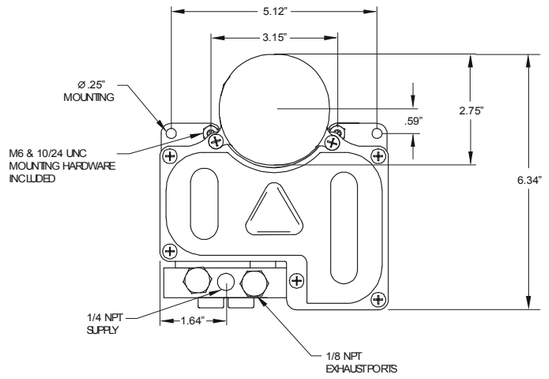
FAST TRACK DELIVERY

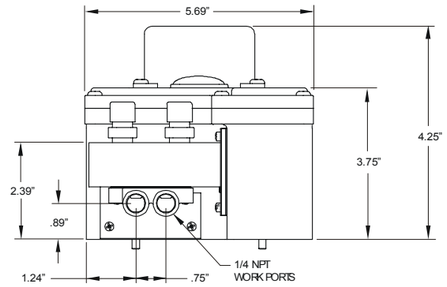
DVC-ASZ2BPS44
AS-Interface
Zone 2 (Class I, Div 2)
4-way solenoid valve

DVC-FFZ0BPP44
FOUNDATION Fieldbus
Zone 0 (Class I, Div 1)
Intrinsically Safe
4-way pilot valve

DVC-DNZ2BPS44
DeviceNet
Zone 2 (Class I, Div 2)
4-way solenoid valve

Dimensions





Enclosure

Enclosure
Material: PBT blend
Specifications: Flame UL94-0 & UV resistant

Target
Material: PBT blend
Specifications: Flame UL94-V0 & UV resistant
Adjustment: 360° in 3° increments
Dome: Polycarbonate, UV & impact resistant

Conduit Entries: (2) ½" NPT standard; (2) M20 metric optional

Cover Gasket: Silicone; Flame UL94-V0 & UV resistant

Fasteners: All 303 series stainless steel

Mounting
NAMUR: Direct - no brackets or couplers
Non-NAMUR: Interface plate. See page 171.

Temperature Rating: Determined by other components

Environment: NEMA Type 4, 4X; IP66

DVC Discrete Valve Controller

Sensor-Communications Module

AS AS-Interface
(Area Classification must be Z2)
(See page 174 for SCM-ASi specifications)

FF FOUNDATION Fieldbus, standard 2-wire
(See page 176 for SCM-FF specifications)

DN DeviceNet
(Area Classification must be Z2)

DA DeviceNet with analog input
(Area Classification must be Z2)

(See page 175 for SCM-DN specifications)

PB Profibus DP
(Area Classification must be Z2)
(See page 178 for SCM-PB specifications)

MB Modbus
(Area Classification must be Z2)
(See page 179 for SCM-MB specifications)

Area Classification

Z0 Intrinsically Safe
Zone 0
EEx ia IIC
Class I, Div 1 & 2, Groups A,B,C,D
Class II, Div 1 & 2, Groups E,F,G
Class III
(SCM option must be FF)
(Pilot Valve option must be P44 or P45)

Z2 Non-Incendive
Zone 2
EEx nc IIC
Class I, Div 2, Groups A,B,C,D
Class II, Div 2, Groups E,F,G
Class III

May be installed Intrinsically Safe per NEC Article 504 and with entity approved barrier.

Install as Non-Incendive per NEC Article 501.

Visual Display

Target Colors: Green and Red

BriteLite Colors: Green and Red

BriteLite Lens: Polycarbonate, UV resistant

B Dome and BriteLite (90° Green/Red)

N Dome only (90° Green/Red)

Consult factory for additional color and rotation options.

Wiring

P ½" NPT conduit

M M20 metric conduit (includes adapter fitting)

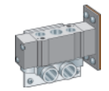
1 Mini-change quick disconnect

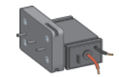
3 Euro-change quick disconnect

5 AS-i flat cable adapter
(SCM option must be AS)
(Not rated for hazardous locations)

For Zone 2 (Class 1, Div 2) applications of Wiring options 1 & 3, see page 117 for quick disconnect guards.

Pilot Valve


Solenoid Valve


Piezo Valve

S44 Solenoid valve with 24VDC, 1.2 Cv, 0.6 watt, aluminum, 4-way
(not available with FF SCM option)

S45 Solenoid valve with 24VDC, 1.2 Cv, 0.6 watt, stainless steel, 4-way
(not available with FF SCM option)

P44 Piezo valve with 1.2 Cv, 0.005 watt, aluminum, 4-way
(SCM option must be FF)

P45 Piezo valve with 1.2 Cv, 0.005 watt, stainless steel, 4-way
(SCM option must be FF)

Don't forget! Filtered air is required for proper valve operation. See our Air Filter on page 170.

Ordering Guide

Fill in the boxes to create your 'ordering number.'

Enclosure		Sensor-Communications Module		Area Classification		Visual Display		Wiring		Pilot Valve
DVC	-									

EXPLOSION PROOF • INTRINSICALLY SAFE

Valvetop DXP

The Valvetop DXP combines position sensors, bus networking, and an integral pilot valve into an explosion-proof enclosure with UL/CSA and ATEX approvals.

Features: Zone 0 (Intrinsically Safe)
Zone 1 Explosion Proof
Aluminum enclosure

Options: FOUNDATION Fieldbus
DeviceNet
AS-i
Modbus
GO Switch leverless limit switches
Mechanical limit switches
Pepperl & Fuchs prox sensors

FAST TRACK DELIVERY

DXP-FF□G_EBPA2
FOUNDATION Fieldbus
Exp. Proof or Intr. Safe
5/4 Aluminum pilot valve

DXP-FF□G_EB*
FOUNDATION Fieldbus
Exp. Proof or Intr. Safe
*TopWorx bolt-on or NAMUR pilot valve is required if DXP-FF is intended to control actuator directly.

DXP-DN1G_EB1A2
DeviceNet
Explosion Proof
5/4 Aluminum pilot valve

DXP-DN1G_EB
DeviceNet
Explosion Proof

DXP-AS1G_EB1A2
AS-Interface
Explosion Proof
5/4 Aluminum pilot valve

DXP-AS1G_EB
AS-Interface
Explosion Proof

DXP-L21G_EB1A2
(2) GO Switches
Explosion Proof
24VDC 5/4 Aluminum pilot valve

DXP-L21G_EB
(2) GO Switches
Explosion Proof

DXP-M21G_EB
(2) Mechanical Switches
Explosion Proof

□ For Area Class, choose **0** (I.S. or **1** (Exp. Proof)
__ For Shaft, choose **S** or **N** (both in stock)

Enclosure

DXP Valvetop DXP

Enclosure: Die-cast aluminum; O-ring sealed

Coating: Tropicalized inside and out

Cover bolts: 6 captive slotted stainless steel screws

Terminal Strip: Standard 12 pt. molded nylon

Temperature Rating: Determined by internal components - Consult Factory

Environment: Designed for NEMA Type 4, 4X, 7, 9; IP67

Bus/Sensor

AS AS-Interface (Area class must be 1)
FF FOUNDATION Fieldbus (Pilot must be P, R, or U)
DN DeviceNet (Area class must be 1)
MB Modbus (Area class must be 1)

GO Switches
(Specify qty: 2 or 4, i.e. L2 or L4)
L_ GO Switches, hermetically sealed SPDT

Mechanical Switches
(Specify qty: 2, 4 or 6; i.e. M2, M4 or M6)
M_ Mechanical SPDT
T2 Mechanical DPDT
K_ Mechanical SPDT - gold contacts

Inductive Switches
(Specify qty: 2 or 4, i.e. E2 or E4)
E_ (2) p+f NJ2-V3-N inductive NAMUR

Analog Output
(Available with 0 or 2 switches for L, M, and K only*)
_X 4-20mA transmitter (0-90º)
_Y 4-20mA transmitter (0-90º I.S.)
_U 4-20mA transmitter (0-60º) (works for 45º)
_A 0-1k Ohm pot.
_B 0-10k Ohm pot.

*Examples:
LX = (2) GO Switches with transmitter
MA = (2) SPDT mech w/1k Ohm Pot
0X = no switches with transmitter

00 No switches

Area Classification

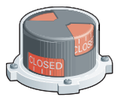
0 Intrinsically Safe* Class I, Div.1 & 2, Groups A,B,C,D Zone 0 EEx ia IIC T4, II1G IP67

1 Explosion Proof Class I, Div.1 & 2, Groups C and D Zone 1 EEx d IIB T4, II2G IP67

* With approved I.S. barrier

Visual Display

Visual Display: Impact resistant polycarbonate; O-ring sealed; 360° adjustable; bolt-on



G Standard 90° Green OPEN, Red CLOSED

B 90º Black OPEN, Yellow CLOSED

4 45º Green OPEN, Red CLOSED

X 45º Black OPEN, Yellow CLOSED

Shaft

Shaft: Stainless steel; O-ring sealed

Shaft Retainer: Stainless steel

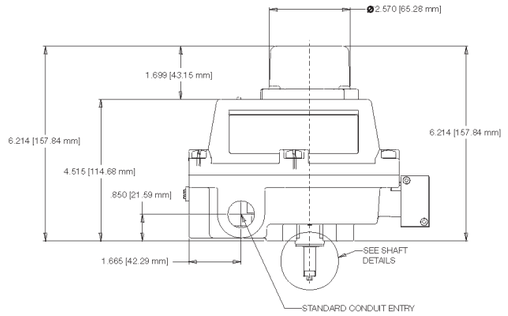
Standard NAMUR

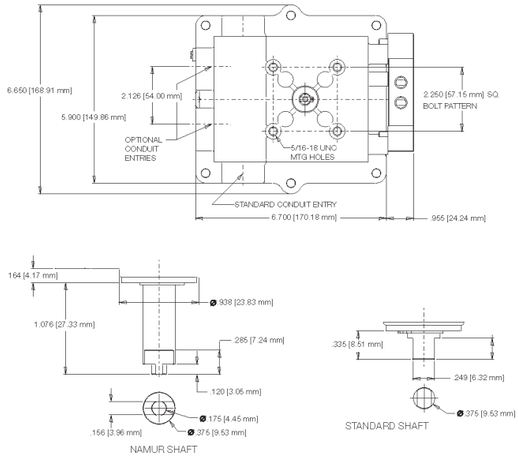
S 1/4" DD 304 stainless steel

N NAMUR 304 stainless steel

Rotary Solutions

Dimensions





Conduit Entries

E (2) 3/4" NPT

4 (2) 3/4" NPT
(2) 1/2" NPT

M (2) M20

5 (2) M20
(2) M16

O-Rings

B Buna-N

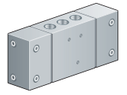
Pilot

Blank - No pilot device(s)

1 (1) 24Vdc pilot, .6W, fail open/ closed
2 (2) 24Vdc pilots, .6W, fail last position
3 (2) 24Vdc pilots, .6W, block center
7 (1) 110Vac pilot, 1.1W, fail open/ closed
8 (2) 110Vac pilots, 1.1W, fail last position
9 (2) 110Vac pilots, 1.1W, block center
P (1) piezo pilot, fail open/ closed (FF only)
R (2) piezo pilots, fail last position (FF only)
U (2) piezo pilots, block center (FF only)

Spool Valve

Blank - No spool valve



A Aluminum - black hard coat anodized

S 304 Stainless

6 316 Stainless

Don't forget!
Filtered air is required for proper valve operation. Reference the TopWorx catalog for additional air filter information.

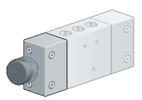
Valve Cv

Blank - No spool valve

2 1.2 Cv

Manual Override

Blank - No override



1 Single Pushbutton Momentary/Latching

2 Dual Pushbutton Momentary/Latching

3 Single Pushbutton Momentary

4 Dual Pushbutton Momentary

A Single palm actuator Momentary/Latching

B Dual palm actuator Momentary/Latching

C Single palm actuator Momentary

D Dual palm actuator Momentary

Lumitech IVC

502.969.8000

INTRINSICALLY SAFE • NON-INCENDIVE

IVC: Integrated Valve Controller

The Lumitech IVC combines position sensors and an onboard solenoid valve into a unique direct-mount enclosure that saves space and installation costs.

Features:
- Integral solenoid valve
- Direct mount with no brackets
- BriteLite early warning LEDs
- Zone 0 (Intrinsically Safe)
- Zone 2 (Class I, Div 2)

Options:
- GO Switch leverless limit switches
- Proximity sensors
- Stainless steel solenoid valve

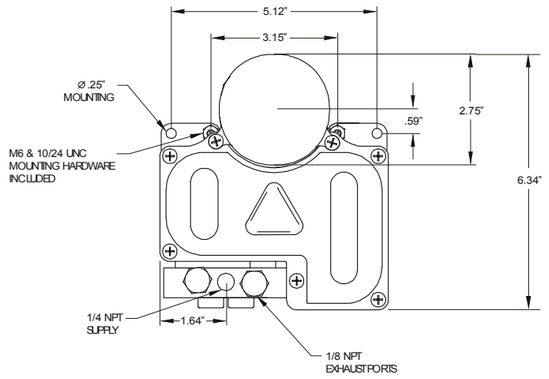
FAST TRACK DELIVERY

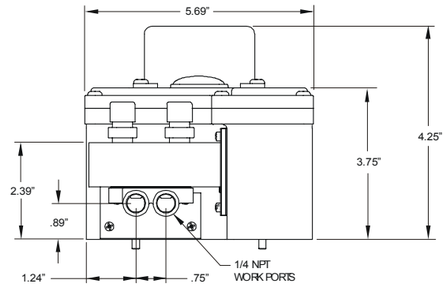
IVC-G2Z2BP□
(2) GO Switches
Zone 2 (Class I, Div 2)
4-way AC or DC solenoid valve

IVC-D2Z2BP□
(2) Proximity sensors
Zone 2 (Class I, Div 2)
4-way AC or DC solenoid valve

□ For Solenoid Valve, choose S44 or 144 (both in stock)

Dimensions





Enclosure

Enclosure
Material: PBT blend
Specifications: Flame UL94-0 & UV resistant

Target
Material: PBT blend
Specifications: Flame UL94-V0 & UV resistant
Adjustment: 360° in 3° increments
Dome: Polycarbonate, UV & impact resistant

Conduit Entries: (2) ½" NPT standard; (2) M20 metric optional

Cover Gasket: Silicone; Flame UL94-V0 & UV resistant

Fasteners: All 303 series stainless steel

Mounting
NAMUR: Direct - no brackets or couplers
Non-NAMUR: Interface plate. See page 171.

Operating Temperature: Determined by other components

Environment: NEMA Type 4, 4X; IP66

IVC Integrated Valve Controller

Sensor

GO Switches

G2 (2) GO Switches, hermetically sealed SPDT

Without BriteLite: 4A/120VAC; 3A/24VDC
With BriteLite: 0.25A/120VAC; 0.25A/24VDC

Proximity Sensors

D2 (2) Hermetically sealed SPDT

Without BriteLite: 1A/120VAC; 0.5A/24VDC
With BriteLite: 0.25A/120VAC; 0.25A/24VDC

See page 180 for wiring diagrams and page 192 for GO Switch specifications.

Area Classification

Z0 Intrinsically Safe
Zone 0
EEx ia IIc
Class I, Div 1 & 2, Groups A,B,C,D
Class II, Div 1 & 2, Groups E,F,G
Class III
(Solenoid Valve option must be S44 or S45)

Z2 Non-Incendive
Zone 2
EEx nc IIc
Class I, Div 2, Groups A,B,C,D
Class II, Div 2, Groups E,F,G
Class III

May be installed Intrinsically Safe per NEC Article 504 and with entity approved barrier.

Install as Non-Incendive per NEC Article 501.

Visual Display

Target Colors: Green and Red

BriteLite Colors: Green and Red

BriteLite Lens: Polycarbonate, UV resistant

B Dome and BriteLite (90° Green/Red)

N Dome only (90° Green/Red)

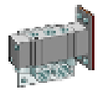
Consult factory for additional color and rotation options.

Wiring

P ½" NPT conduit

M M20 metric conduit (includes adapter fitting)

Solenoid Valve



S44 24VDC with 1.2 Cv, 0.6 watt, aluminum, 4-way

S45 24VDC with 1.2 Cv, 0.6 watt, stainless steel, 4-way

144 120VAC with 1.2 Cv, 1.1 watt, aluminum, 4-way

145 120VAC with 1.2 Cv, 1.1 watt, stainless steel, 4-way

Don't Forget! Filtered air is required for proper valve operation. See our Air Filter on page 170.

Ordering Guide

Fill in the boxes to create your 'ordering number.'

Enclosure		Sensor		Area Classification		Visual Display		Wiring		Solenoid Valve
IVC	-									

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Lumitech IVM

502.969.8000

INTRINSICALLY SAFE • NON-INCENDIVE

IVM: Integrated Valve Monitor

The Lumitech IVM offers the same functionality as the IVC, less the onboard solenoid valve. Choose the IVM when you prefer a specific brand of solenoid, which can be wired directly to spare terminals in the IVM.

Features:
- Terminals to wire in external solenoid
- Direct mount with no brackets
- BriteLite early warning LEDs
- Zone 0 (Intrinsically Safe)
- Zone 2 (Class I, Div 2)

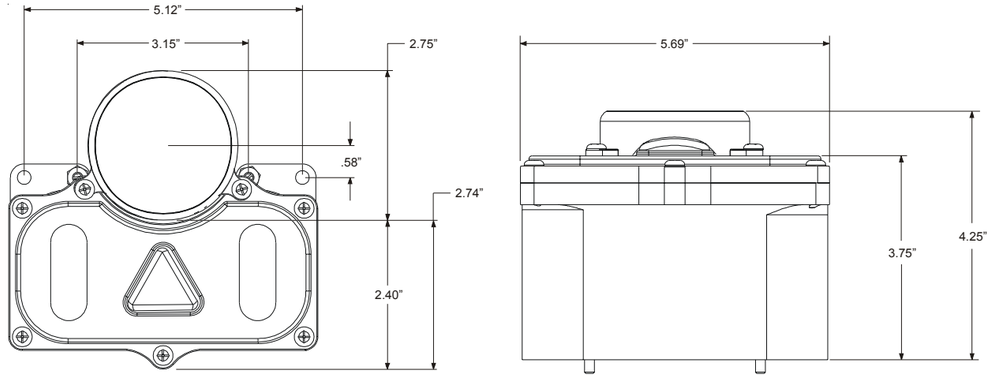
Options:
- GO Switch leverless limit switches
- Proximity sensors

FAST TRACK DELIVERY

IVM-G2Z2BP
(2) GO Switches
Zone 2 (Class I, Div 2)

IVM-D2Z2BP
(2) Proximity sensors
Zone 2 (Class I, Div 2)

Dimensions



Enclosure

Enclosure
Material: PBT blend
Specifications: Flame UL94-0 & UV resistant

Target
Material: PBT blend
Specifications: Flame UL94-V0 & UV resistant
Adjustment: 360° in 3° increments
Dome: Polycarbonate, UV & impact resistant

Conduit Entries: (2) ½" NPT standard; (2) M20 metric optional

Cover Gasket: Silicone; Flame UL94-V0 & UV resistant

Fasteners: All 303 series stainless steel

Mounting
NAMUR: Direct - no brackets or couplers
Non-NAMUR: Interface plate. See page 171.

Operating Temperature: Determined by other components

Environment: NEMA Type 4, 4X; IP66

IVM Integrated Valve Monitor

Sensor

GO Switches

G2 (2) GO Switches, hermetically sealed SPDT

Without BriteLite: 4A/120VAC; 3A/24VDC
With BriteLite: 0.25A/120VAC; 0.25A/24VDC

Proximity Sensors

D2 (2) Hermetically sealed SPDT

Without BriteLite: 1A/120VAC; 0.5A/24VDC
With BriteLite: 0.25A/120VAC; 0.25A/24VDC

See page 180 for wiring diagrams and page 192 for GO Switch specifications.

Area Classification

Z0 Intrinsically Safe
Zone 0
EEx ia IIc
Class I, Div 1 & 2, Groups A,B,C,D
Class II, Div 1 & 2, Groups E,F,G
Class III

Z2 Non-Incendive
Zone 2
EEx nc IIc
Class I, Div 2, Groups A,B,C,D
Class II, Div 2, Groups E,F,G
Class III

NOTE: GO Switch and Proximity Sensor options are classified as "simple devices," and are suitable for Intrinsically Safe applications.

May be installed Intrinsically Safe per NEC Article 504 and with entity approved barrier.

Install as Non-Incendive per NEC Article 501.

Visual Display

Target Colors: Green and Red

BriteLite Colors: Green and Red

BriteLite Lens: Polycarbonate, UV resistant

B Dome and BriteLite (90° Green/Red)

N Dome only (90° Green/Red)

Consult factory for additional color and rotation options.

Wiring

P ½" NPT conduit

M M20 metric conduit (includes adapter fitting)

Ordering Guide

Fill in the boxes to create your 'ordering number.'

Enclosure		Sensor	Area Classification	Visual Display	Wiring
IVM	-				

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Lumitech PPS

502.969.8000

GENERAL PURPOSE

PPS: Puck Position Sensor

The Lumitech PPS is the choice for simple valve position monitoring in general purpose environments.

Its space-saving design and resin enclosure make it the ideal choice for heavy washdown applications, often found in the food and beverage industries.

Features: A third the size of switchboxes
BriteLite early warning LEDs

Options: AS-Interface
Proximity sensors

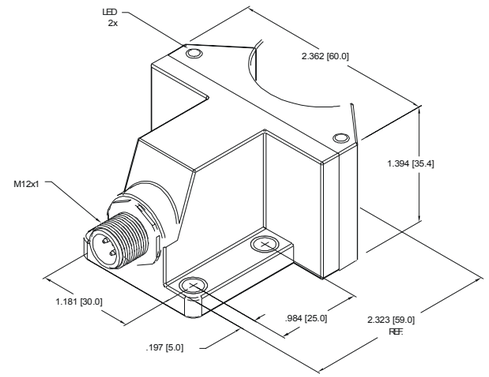
FAST TRACK DELIVERY

PPS-ASGPT1
IP67
AS-Interface protocol
Inductive sensors
90° fixed target

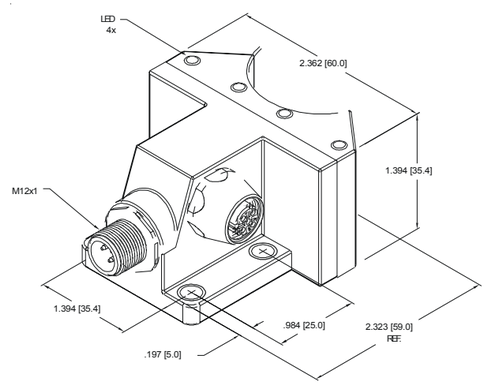
PPS-3SGPT1
IP67
DC 3-wire inductive sensors
90° fixed target

PPS-NSZ0T1
Intrinsically Safe
Inductive proximity sensors
90° fixed target

Dimensions



With Sensor option 3S or NS



With Sensor option AS

Enclosure

Operating Temperature: -13° to 158°F (-25° to 70°C)

Housing Material: Polypropylene (PP)

Connector Material: CuZn, chrome plated

Protection: IP67

PPS Puck Position Sensor

Sensor

AS **AS-Interface protocol & inductive sensors**
2 inputs, 1 output
(open sensor, close sensor, output open)
No-load Current: ≤ 30mA
Supply Voltage: 18 to 33VDC
Supply Current ≤ 110mA
Output Current ≤ 80mA

3S **DC 3-wire inductive sensors**
Supply Voltage: 10-65VDC, PNP inputs
Rated Operational Current: 200mA
No-load Current: ≤ 15mA

NS **(2) Inductive proximity sensors**
NAMUR Intrinsically Safe, EEx ia IIC T6
Supply Voltage: 8.2VDC
Output Activated: ≤ 1mA
Output Non-activated: ≥ 2.2mA

See page 182 for wiring diagrams.

Area Classification

Z0 Instrinsically Safe
Zone 1
Class I, Div 1
(Sensor option must be NS)

GP For use in ordinary environments

Target

T1 90° fixed
Polyoxymethylene (POM)
Stainless steel targets
20 or 30 mm shaft

T2 Adjustable position
Polyoxymethylene (POM)
Stainless steel targets
20 mm shaft

T3 Adjustable position
Polyoxymethylene (POM)
Stainless steel targets
30 mm shaft

T4 90° fixed
Aluminum
Polyoxymethylene targets
20 or 30 mm shaft
(Select this target for normally closed operation)

Ordering Guide

Fill in the boxes to create your 'ordering number.'

Enclosure	Sensor	Area Classification	Target
PPS			

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Switchpak SSP

502.969.8000

EXPLOSION PROOF • INTRINSICALLY SAFE

Switchpak SSP

The Switchpak SSP is the classic valve position monitor, offering superb visual display, simple operation, and easy installation in a rugged metal enclosure.

Features: Rugged aluminum enclosure
Zone 1 (Class I, Div 1)

Options: GO Switch leverless limit switches
Mechanical limit switches
Proximity sensors

FAST TRACK DELIVERY

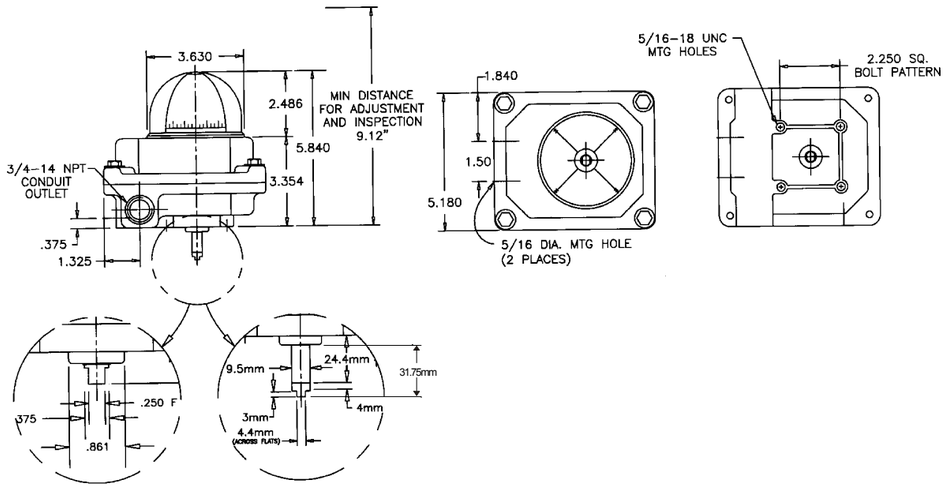
SSP-XPL2GR□00
(2) GO Switches
Zone 1 (Class I, Div 1)
Aluminum enclosure

SSP-XPM2GR□00
(2) Mechanical SPDT switches
Zone 1 (Class I, Div 1)
Aluminum enclosure

SSP-XPT2GR□00
(2) Mechanical DPDT switches
Zone 1 (Class I, Div 1)
Aluminum enclosure

□ For Shaft, choose S or N (both in stock)

Dimensions



Enclosure

Enclosure: Die-cast aluminum; O-ring sealed

Coating: Dichromate conversion inside and out; powder polyester coating outside

O-rings: Buna N; Viton optional

Cover Bolts: 4 captive hex stainless steel screws

Conduit Outlets: Two ¾" NPT

Terminal Strip Contacts: Standard 12 or 16-point with minimum of 2 open contacts provided for accessories

Temperature Rating: Determined by sensor option

Environment: NEMA Type 4, 4X, 7 and 9

SSP Switchpak SSP

Area Classification

XP Explosion Proof
Zone 1
Class I, Div 1 & 2, Groups C,D
Class II, Div 1 & 2, Groups E,F,G
(Class I, Div 2, Groups A,B with hermetically-sealed switches only)

CE Marking
EMC Directive 89/336/EEC

May be installed Intrinsically Safe per NEC Article 504 and with entity approved barrier.

Install per Article 501 as Explosion Proof.

Sensor

00 None

GO Switches
L4 (4) GO Switches, hermetically sealed SPDT
L2 (2) GO Switches, hermetically sealed SPDT

Mechanical Switches (Groups C & D only)
M4 (4) Mechanical SPDT
M2 (2) Mechanical SPDT
T2 (2) Mechanical DPDT

Proximity Sensors
D4 (4) Hermetically sealed SPDT
D2 (2) Hermetically sealed SPDT
W4 (4) Hermetically sealed SPST
W2 (2) Hermetically sealed SPST

See pages 192-193 for sensor specifications.

Visual Display

Visual Display: Impact resistant polycarbonate; O-ring sealed; 360° adjustable; EaStar™ optional (green/red indicator standard)

GR Green/Red indicator dome
FT Flat top cover (no visual indication)
BY Black/Yellow indicator dome
TD 120° through divert indicator dome
01 90° 2 position, 3 way indicator dome
05 Multi-function, 2 position/3 position, 3 way indicator dome
13 180° 3 position block center indicator dome
RG Red/Green indicator dome (Red=open, Green=closed)
ES EaStar™ Green/Red indicator dome
45 45° 4 position indicator dome

Shaft

Standard NAMUR

Shaft: Stainless steel; O-ring sealed

Shaft Retainer: Stainless steel

N NAMUR shaft
S Standard ¼" flat shaft
2 Standard shaft with high resolution cams 2.2° dead band (mechanical switches only)
3 NAMUR shaft with high resolution cams 2.2° dead band (mechanical switches only)

Analog Output

4-20mA Potentiometer

00 None
42 4-20mA transmitter (sensors L4, M4, D4 & W4 excluded)
01 Potentiometer 0-1K (sensors L4, M4, D4 & W4 excluded)
10 Potentiometer 0-10K (sensors L4, M4, D4 & W4 excluded)
50 Potentiometer 0-50K (sensors L4, M4, D4 & W4 excluded)

Ordering Guide

Fill in the boxes to create your 'ordering number.'

Enclosure		Area Classification	Sensor	Visual Display	Shaft	Analog Output
SSP	-	XP				

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Switchpak SXP

502.969.8000

EXPLOSION PROOF • INTRINSICALLY SAFE

Switchpak SXP

The Switchpak SXP combines position sensors and an onboard solenoid valve into a rugged aluminum explosion-proof enclosure that is Cenelec rated and suitable for Zone 1 applications.

Features: Cenelec rated
Zone 1 (Class I, Div 1)
Aluminum enclosure

Options: GO Switch leverless limit switches
Mechanical switches
Proximity sensors
Analog output
Integral solenoid valve
Up to four conduit entries

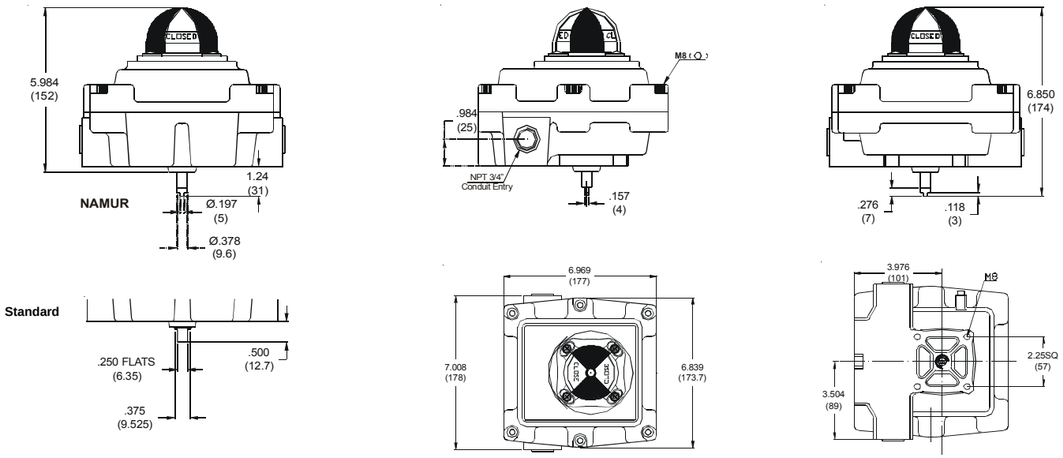
FAST TRACK DELIVERY

SXP-L2Z1GR□00000
(2) GO Switches
Zone 1 (Class I, Div 1)
Aluminum enclosure

SXP-M2Z1GR□00000
(2) Mechanical SPDT switches
Zone 1 (Class I, Div 1)
Aluminum enclosure

□ For Shaft, choose S or N (both in stock)

Dimensions



Enclosure

Enclosure: Die-cast aluminum; O-ring sealed

Coating: Dichromate conversion or anodize inside; powder polyester coating outside

O-rings: Buna N; Viton optional

Cover Bolts: 6 captive socket head stainless steel screws

Conduit Entries: Two 3/4" NPT (Four optional)

Terminal Strip Contacts: Located on SCM

Temperature Rating: Determined by sensor option

Environment: NEMA Type 4, 4X, 7, 9; IP66

SXP Switchpak SXP

Sensor

00 None

GO Switches
L2 (2) GO Switches, hermetically sealed SPDT

Mechanical Switches (Groups C & D only)
M2 (2) Mechanical SPDT
M4 (4) Mechanical SPDT
T2 (2) Mechanical DPDT

Proximity Sensors
D2 (2) Hermetically sealed SPDT
E2 (2) Pepperl + Fuchs NJ2-V3-N
F2 (2) Pepperl + Fuchs NJ2-11-SN-G
P2 (2) Inductive non-NAMUR sensors

See pages 192-193 for sensor specifications.

Area Classification

Z1 Explosion Proof/Flame Proof
Zone 1
EEx d IIB
Class I, Div 1 & 2, Groups A,B,C,D
Class II, Div 1 & 2, Groups E,F,G
Class III

May be installed Intrinsically Safe per NEC Article 504 and with entity approved barrier.

Visual Display

Visual Display: Impact resistant polycarbonate; O-ring sealed; 360° adjustable; bolt-on

GR Green/Red indicator dome

BY Black/Yellow indicator dome

TD 120° through divert indicator dome

Shaft

Shaft: Stainless steel; O-ring sealed

Shaft Retainer: Stainless steel

N NAMUR shaft

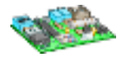
S Standard 1/4" flat shaft

Pilot Valve

000 No Pilot Valve

Consult factory for a variety of solenoid valve options for single coil, dual coil, and dribble control options.

Analog Output



00 None
42 4-20mA transmitter
01 Potentiometer 0-1K
10 Potentiometer 0-10K

Ordering Guide

Fill in the boxes to create your 'ordering number.'

Enclosure		Sensor	Area Classification	Visual Display	Shaft	Pilot Valve	Analog Output
SXP	-		Z1				

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Switchpak SXS

502.969.8000

EXPLOSION PROOF • INTRINSICALLY SAFE

Switchpak SXS

The Switchpak SXS combines position sensors and an onboard solenoid valve into a rugged stainless steel explosion-proof enclosure that is Cenelec rated and suitable for Zone 1 applications.

Features: Cenelec rated
Zone 1 (Class I, Div 1)
Stainless Steel enclosure

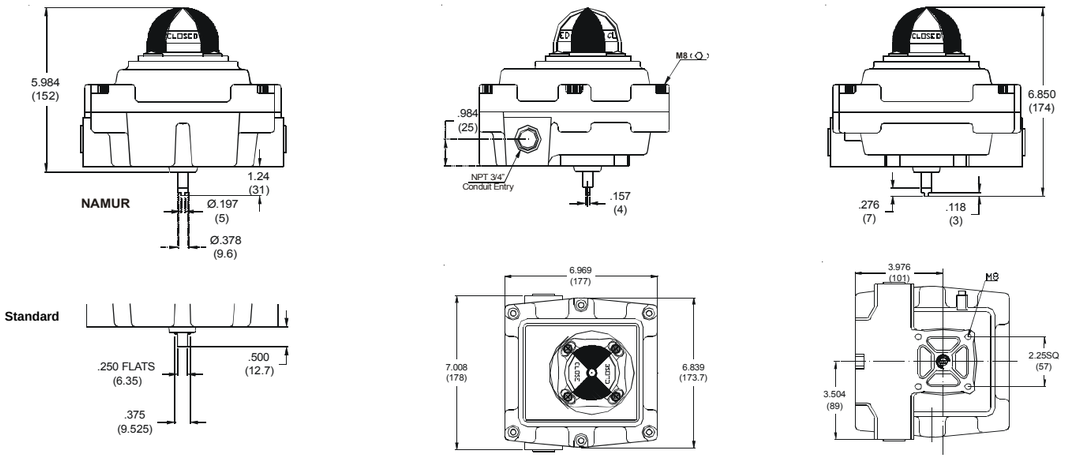
Options: GO Switch leverless limit switches
Mechanical SPDT switches
Proximity sensors
Analog output
Integral solenoid valve
Up to four conduit entries

Discrete Valve Control

TOPWORX

Rotary Solutions

Dimensions



Enclosure

Enclosure: Stainless steel; O-ring sealed

Coating: Powder polyester coating outside

O-rings: Buna N; Viton optional

Cover Bolts: 6 captive socket head stainless steel screws

Conduit Entries: Two 3/4" NPT (Four optional)

Terminal Strip Contacts: Located on SCM

Temperature Rating: Determined by sensor option

Environment: NEMA Type 4, 4X, 7, 9; IP66

SXS Switchpak SXS

Sensor and Analog Output

00 None

GO Switches

L2 (2) GO Switches, hermetically sealed SPDT

Mechanical Switches (Groups C & D only)

M2 (2) Mechanical SPDT
M4 (4) Mechanical SPDT
T2 (2) Mechanical DPDT

Proximity Sensors

D2 (2) Hermetically sealed SPDT
E2 (2) Pepperl + Fuchs NJ2-V3-N
F2 (2) Pepperl + Fuchs NJ2-11-SN-G
P2 (2) Inductive non-NAMUR sensors

See pages 192-193 for sensor specifications.

Area Classification

Z1 Explosion Proof/Flame Proof
Zone 1
EEx d IIB
Class I, Div 1 & 2, Groups A,B,C,D
Class II, Div 1 & 2, Groups E,F,G
Class III

May be installed Intrinsically Safe per NEC Article 504 and with entity approved barrier.

Visual Display

Visual Display: Impact resistant polycarbonate; O-ring sealed; 360° adjustable; bolt-on

GR Green/Red indicator dome

BY Black/Yellow indicator dome

TD 120° through divert indicator dome

Shaft

Shaft: Stainless steel; O-ring sealed

Shaft Retainer: Stainless steel

N NAMUR shaft

S Standard 1/4" flat shaft

Pilot Valve

000 No Pilot Valve

Consult factory for a variety of solenoid valve options for single coil, dual coil, and dribble control options.

Analog Output

00 None

42 4-20mA transmitter

01 Potentiometer 0-1K

10 Potentiometer 0-10K

Ordering Guide

Fill in the boxes to create your 'ordering number.'

Enclosure		Sensor and Analog Output	Area Classification	Visual Display	Shaft	Pilot Valve	Analog Output
SXS	-		Z1				

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Switchpak SRP

The Switchpak SRP delivers the same features, benefits, and options as the SSP in a chemical resistant resin enclosure. The SRP is an excellent choice in corrosive or washdown applications.

Features: Engineered resin enclosure
Zone 2 (Class I, Div 2)

Options: GO Switch leverless limit switches
Mechanical limit switches
Proximity sensors

FAST TRACK DELIVERY

SRP-4XL2GR□00
(2) GO Switches
Zone 2 (Class I, Div 2)
Engineered resin enclosure

SRP-4XM2GR□00
(2) Mechnical SPDT switches
Zone 2 (Class I, Div 2)
Engineered resin enclosure

□ For Shaft, choose S or N (both in stock)

Enclosure

Enclosure: Zytel™ engineered resin; 33% glass filled reinforced Nylon with UV inhibitor; tongue-in-groove O-ring sealed

O-rings: Buna N; Viton optional

Cover Bolts: 4 captive phillips head stainless steel screws

Conduit Outlets: Two ¾" NPT

Terminal Strip Contacts: Standard 12-point with minimum of 2 open contacts provided for accessories

Mounting: Nickel plated brass inserts

Temperature Rating: Determined by sensor option

Environment: NEMA Type 4, 4X

SRP Switchpak SRP

Area Classification

c UL us LISTED

CE

4X Non-Incendive
Zone 2
Class I, Div 2, Groups A,B,C,D
Class II, Div 2, Groups E,F,G
(Analog Output option must be 00)
(Not rated for hazardous locations with Mechanical Sensor option)

CE Marking
EMC Directive 89/336/EEC

May be installed Intrinsically Safe per NEC Article 504 and with entity approved barrier.

Install per NEC Article 501 as non-incendive.

Sensor

00 None

GO Switches
L4 (4) GO Switches, hermetically sealed SPDT
L2 (2) GO Switches, hermetically sealed SPDT

Mechanical Switches
M4 (4) Mechanical SPDT
M2 (2) Mechanical SPDT
T2 (2) Mechanical DPDT

Not rated for hazardous locations.

Proximity Sensors
D4 (4) Hermetically sealed SPDT
D2 (2) Hermetically sealed SPDT
W4 (4) Hermetically sealed SPST
W2 (2) Hermetically sealed SPST

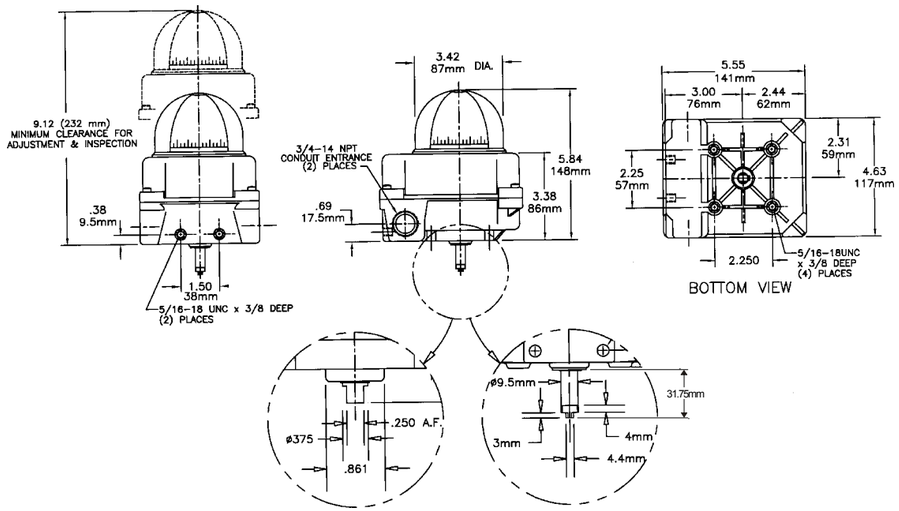
See pages 192-193 for sensor specifications.

Ordering Guide

Fill in the boxes to create your 'ordering number.'

Enclosure		Area Classification		Sensor
SRP	-	4X		

Dimensions



Visual Display

Visual Display: Impact resistant polycarbonate; O-ring sealed; 360° adjustable; EaStar™ optional (green/red indicator standard)

GR Green/Red indicator dome
FT Flat top cover (no visual indication)
BY Black/Yellow indicator dome
TD 120° through divert indicator dome
01 90° 2 position, 3 way indicator dome
05 Multi-function, 2 position/3 position, 3 way indicator dome
13 180° 3 position block center indicator dome
RG Red/Green indicator dome (Red=open, Green=closed)
ES EaStar™ Green/Red indicator dome
45 45° 4 position indicator dome

Shaft

Standard NAMUR

Shaft: Stainless steel; O-ring sealed

Shaft Retainer: Stainless steel

N NAMUR shaft
S Standard ¼" flat shaft
2 Standard shaft with high resolution cams 2.2° dead band (mechanical switches only)
3 NAMUR shaft with high resolution cams 2.2° dead band (mechanical switches only)

Analog Output

4-20mA Potentiometer

00 None
42 4-20mA transmitter (sensors L4, M4, D4 & W4 excluded)
01 Potentiometer 0-1K (sensors L4, M4, D4 & W4 excluded)
10 Potentiometer 0-10K (sensors L4, M4, D4 & W4 excluded)
50 Potentiometer 0-50K (sensors L4, M4, D4 & W4 excluded)

(Only 00 option retains ratings for hazardous locations)

For analog output in hazardous areas, see Switchpak SSP on page 146.

Visual Display	Shaft	Analog Output

Switchpak SUP

502.969.8000

GENERAL PURPOSE • INTRINSICALLY SAFE

Switchpak SUP

The Switchpak SUP is a unique, compact, and cost-effective valve position monitor designed especially for NAMUR rack and pinion actuators. Mounting brackets are included, saving significant time and money.

Features: Anodized aluminum enclosure
Includes mounting brackets
General purpose

Options: Mechanical limit switches
Pepperl + Fuchs proximity sensors

FAST TRACK DELIVERY

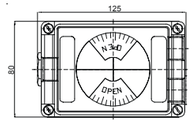
SUP-GPM2GRN00
(2) Mechnical SPDT switches
IP66/IP67
Aluminum enclosure

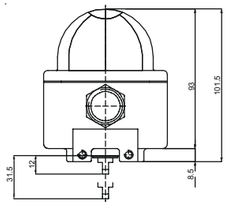
Discrete Valve Control

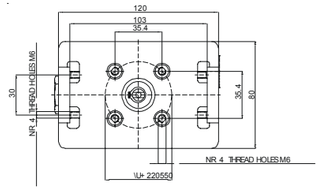
TOPWORX

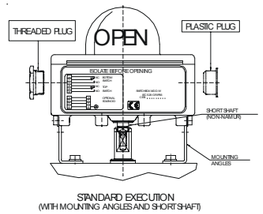
Rotary Solutions

Dimensions

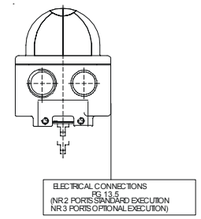








STANDARD EXECUTION
(WITH MOUNTING ANGLES AND SHORT SHAFT)



Enclosure

Enclosure: Anodized aluminum

Coating: Powder polyester coating (inside & outside)

O-rings: Buna N

Cover Bolts: 4 captive phillips head stainless steel screws

Conduit Outlets: Two PG 13, 5

Terminal Strip Contacts: PC board mounted; one strip for switch connection, one pass through for solenoid option

Mounting: Direct mount to any ISO/NAMUR actuator (bracket included)

Temperature Rating: Determined by sensor option

Environment: IEC 529, IP66/IP67

SUP Switchpak SUP

Area Classification

GP For use in ordinary environments

May be installed Intrinsically Safe per NEC Article 504 and with entity approved barrier and Sensor option E2.

Sensor

00 None

Mechanical Switches
M2 (2) Mechanical SPDT

Proximity Sensors
E2 (2) Pepperl + Fuchs NJ2-V3-N
V3 proximity, 2 wire, non-amplified NAMUR
EExia IIC certified

See pages 192-193 for sensor specifications.

Visual Display

Visual Display: Polycarbonate dome with green/red indicators; flat polycarbonate cover with Nylon arrow indicator

GR Green/Red indicator dome

FT Flat top cover (flat visual indication)

Shaft

NAMUR

Shaft: Stainless steel; O-ring sealed

Shaft Retainer: Stainless steel

N NAMUR shaft

For non-NAMUR applications, see Switchpak SEP on page 156.

Analog Output

00 None

Ordering Guide

Fill in the boxes to create your 'ordering number.'

Enclosure		Area Classification	Sensor	Visual Display	Shaft	Analog Output
SUP	-	GP			N	00

Switchpak SEP

502.969.8000

GENERAL PURPOSE • INTRINSICALLY SAFE

Switchpak SEP

The Switchpak SEP is a cost-effective yet versatile valve position monitor for use on NAMUR rack and pinion actuators or non-NAMUR scotch-yoke actuators. The SEP offers superb visual display, simple operation, and easy installation in an aluminum type 4, 4X enclosure.

Features: Coated aluminum enclosure
General purpose

Options: Mechanical limit switches
Proximity SPST switches
Proximity SPDT switches
Third conduit entry

FAST TRACK DELIVERY

SEP-4XM2GR□00
(2) Mechanical SPDT switches
General purpose
Aluminum enclosure

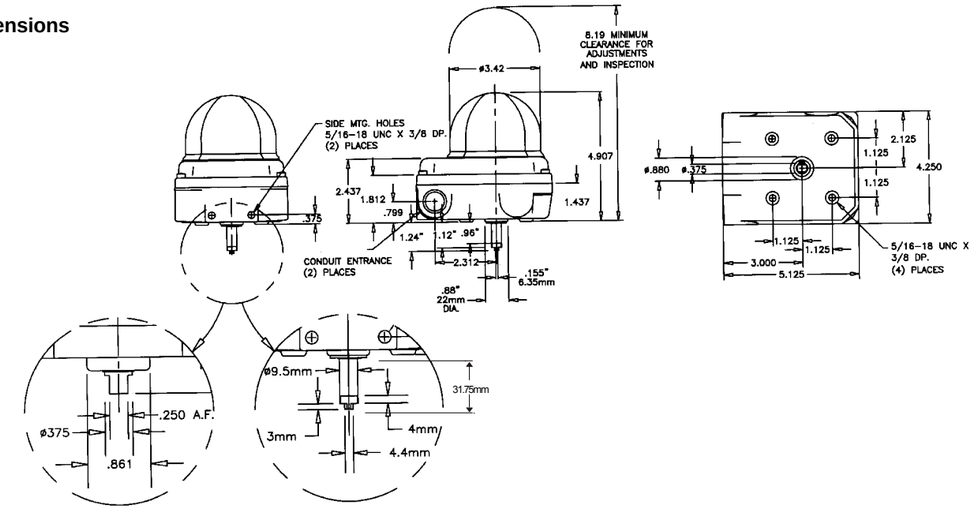
□ For Shaft, choose S or N
(both in stock)

Discrete Valve Control

TOPWORX

Rotary Solutions

Dimensions



Enclosure

Enclosure: Die-cast aluminum

Coating: Powder polyester coating (inside & outside); O-ring sealed

O-rings: Buna N; Viton optional

Cover Bolts: 4 captive phillips head stainless steel screws

Conduit Outlets: Two 1/2" NPT

Terminal Strip Contacts: Standard 12-point with minimum of 2 open contacts provided for accessories

Temperature Rating: Determined by sensor option

Environment: NEMA Type 4, 4X

SEP Switchpak SEP

Area Classification

c UL us LISTED

CE

4X Non-Incendive
Zone 2
Class I, Div 2, Groups A,B,C,D
Class II, Div 2, Groups E,F,G
(Not rated for hazardous locations with mechanical Sensor option)

CE Marking
EMC Directive 89/336/EEC

May be installed Intrinsically Safe per NEC Article 504 and with entity approved barrier.

Install per NEC Article 501 as non-incendive.

Sensor

00 None

Mechanical Switches
M2 (2) Mechanical SPDT
T2 (2) Mechanical DPDT

Not rated for hazardous locations.

Proximity Sensors
D2 (2) Hermetically sealed SPDT
W2 (2) Hermetically sealed SPST

See pages 192-193 for sensor specifications.

Visual Display

Visual Display: Impact resistant polycarbonate; O-ring sealed; 360° adjustable; EaStar™ optional (green/red indicator standard)

GR Green/Red indicator dome

FT Flat top cover (no visual indication)

BY Black/Yellow indicator dome

TD 120° through divert indicator dome

01 90° 2 position, 3 way indicator dome

05 Multi-function, 2 position/3 position, 3 way indicator dome

13 180° 3 position block center indicator dome

RG Red/Green indicator dome (Red=open, Green=closed)

ES EaStar™ Green/Red indicator dome

45 45° 4 position indicator dome

Shaft

Standard NAMUR

Shaft: Stainless steel through bronze bearings; O-ring sealed

Shaft Retainer: Stainless steel

N NAMUR shaft

S Standard 1/4" flat shaft

2 Standard shaft with high resolution cams
2.2° dead band
(mechanical switches only)

3 NAMUR shaft with high resolution cams
2.2° dead band
(mechanical switches only)

Analog Output

00 None

Ordering Guide

Fill in the boxes to create your 'ordering number.'

Enclosure		Area Classification	Sensor	Visual Display	Shaft	Analog Output
SEP	-	4X				00

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Monitoring Solutions for Linear Valves

valvetop When it comes to linear valves, TopWorx has all the applications covered.

Whether it's a control valve, gate valve, globe valve, or diaphragm valve, TopWorx can provide reliable position monitoring in any hazardous area or process environment.

Solutions for all linear valves and actuators:
- Control valves
- Globe valves
- Pinch valves
- Knifegate valves
- Diaphragm valves
- Sanitary valves

Approvals for all hazardous areas:
- Zone 0 intrinsically safe
- Zone 1 explosion proof
- Zone 2 non-incendive

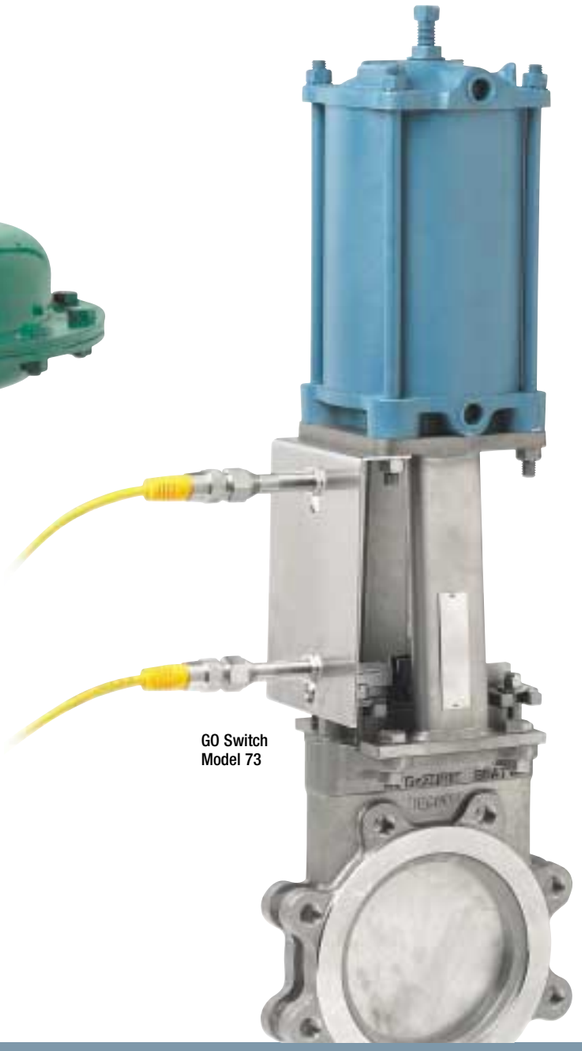
Enclosures for all process environments:
- Engineered resin
- Aluminum
- Stainless steel

Sensors for all applications:
- GO Switch leverless limit switches
- Proximity sensors

Sensor-Communications Modules for all bus networks:
- AS-Interface
- FOUNDATION Fieldbus
- DeviceNet
- Profibus
- Modbus

Other options:
- Green/Red BriteLite LEDs

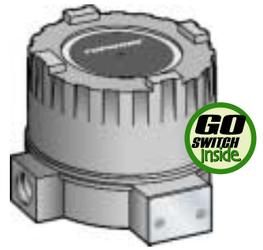
Lumitech LPS



GO Switch Model 73

Conventional

Linear valve monitoring all starts with GO Switch leverless limit switches, suitable for all hazardous areas and process environments.



Switchpak SBP
Zone 1 (Class I, Div 1)
GO Switch Inside

GO Switch 7L & Lumitech LPS
Zone 0, 1, or 2
Green or Red LEDs

GO Switch 73 & 7G
SPDT or DPDT Contacts
HiTemp option to 400°F

Bus Networking

Using TopWorx HazLink I/O Modules coupled with GO Switch leverless limit switches, you can connect your linear valves to a variety of bus protocols.

ASi FOUNDATION PROFIBUS DeviceNet MODBUS

Switchpak SBP

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EXPLOSION PROOF • INTRINSICALLY SAFE

Switchpak SBP

The Switchpak SBP fits snuggly under the bonnet of linear valve actuators to provide reliable position feedback of linear control valves up to a 4" stroke.

Features: No linkages required
Designed for linear valve actuators
Rugged aluminum enclosure
Zone 1 (Class I, Div 1)

Options: GO Switch leverless limit switches
Proximity sensors

FAST TRACK DELIVERY

SBP-XPL2
(2) GO Switches
Zone 1 (Class I, Div 1)
Aluminum enclosure

Enclosure

Enclosure: Die-cast aluminum; O-ring sealed

Coating: Dichromate conversion (inside); powder polyester coating (outside)

O-rings: Buna N

Cover: Screw cover with O-ring seal

Conduit Outlets: Three ¾" NPT

Terminal Strip Contacts: Standard 12-point with minimum of 2 open contacts provided for accessories

Temperature Rating: Determined by sensor option

Environment: NEMA Type 4, 4X, 7 and 9

SBP Switchpak SBP

Area Classification

XP Explosion Proof
Zone 1
Class I, Div 1 & 2, Groups A,B,C,D
Class II, Div 1 & 2, Groups E,F,G

CE Marking
EMC Directive 89/336/EEC

May be installed Intrinsically Safe per NEC Article 504 and with entity approved barrier.

Install per NEC Article 501 as Explosion Proof.

Sensor

00 None

GO Switches
L2 (2) GO Switches, hermetically sealed SPDT
L1 (1) GO Switch, hermetically sealed SPDT

Proximity Sensors
D2 (2) Hermetically sealed SPDT
W2 (2) Hermetically sealed SPST

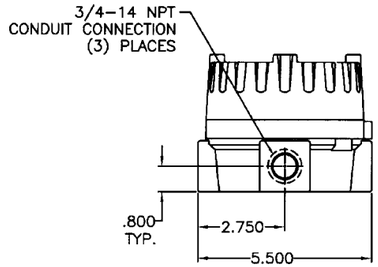
See pages 192-193 for sensor specifications.

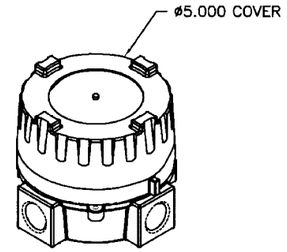
Ordering Guide

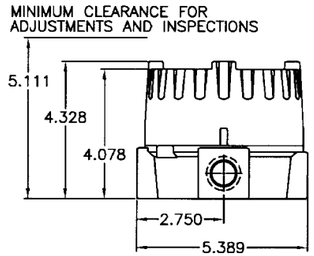
Fill in the boxes to create your 'ordering number.'

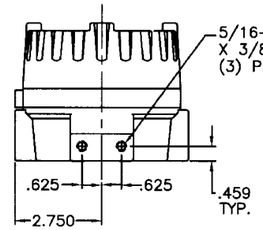
Enclosure		Area Classification		Sensor
SBP	-			

Dimensions

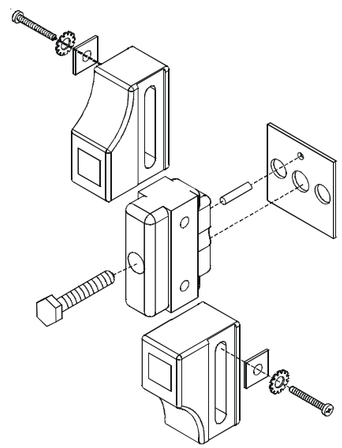








Target Magnet Assembly



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Models 73 and 7G

The GO Switch Model 73 is our most popular leverless limit switch. Its solid stainless steel construction and global certifications make it the ideal choice for a variety of applications. Model 7G adds hermetic seal and Double Pole Double Throw contact options.

Features: SPDT or DPDT 4A contacts
Intrinsically Safe
-40° to 221°F operating temperature

Options: Suitable for Zone 0, 1, or 2 explosion proof
-40° to 400°F high temperature
Hermetic Seal
Quick Disconnect connector
Underwater capabilities
English or Metric threads

FAST TRACK DELIVERY

73-13523-A2
Class I Div 1, 3 ft. leads

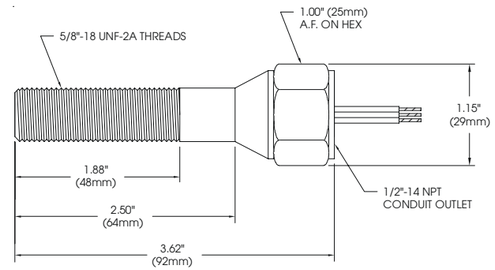
73-13524-A2
Class I Div 1, 3 ft. leads

73-13526-A2
Class I Div 2, 3 ft. leads

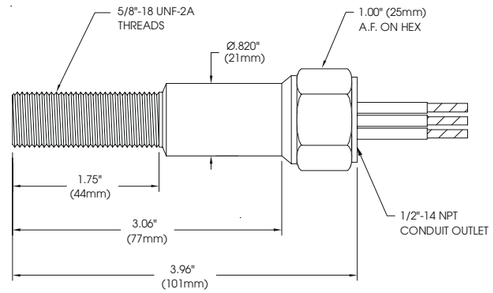
7G-23523-A2
DPDT Class I Div 1, 3 ft. leads

7G-23526-A2
DPDT Class I Div 2, 3 ft. leads

Dimensions



Model 73



Model 7G

Model

Repeatability: .002" (.05mm) typical

Response Time: 8 milliseconds

Differential: Approx. .020" (.51 mm)

Operating Temperature: -40° to 221°F (-40° to 105°C). Hi Temp to 400°F (204°C)

73 Model 73
$5/8$" (16 mm) dia. x $3\,5/8$" (92 mm) long with $5/8$"-18 UNF x $1\,7/8$" (48 mm) threads and $1/2$" NPT conduit hub

73M Model 73
M18 x 1.5 external metric thread

7G Model 7G
M18 x 1.5 external metric thread

Contact Form

Contact Material: Palladium silver with sawtooth surface configuration

Form: SPDT, Form C

Ratings: Resistive

AC		DC	
Volts	Amps	Volts	Amps
120	4	24	3
240	2	48	1.25
480	*	125	0.5
		250	0.5

1 Single Pole Double Throw (Form C)
Environmental Seal (Model 73)
Hermetic Seal (Model 7G) (Lead seal not required for hazardous locations)

2 Double Pole Double Throw
(Form CC) (Model 7G)

Form C - SPDT

Sensing Range

Target Material: Ferrous steel

Sensing Range: Approx.
.100" (2.5 mm) end sensing (2,000 PSI)
.072" (1.8 mm) end sensing (5,000 PSI)
.060" (1.5 mm) end sensing (10,000 PSI)

Sensing Range with Target Magnet: up to .35" (9 mm)

3 Standard sensing - approx. .100" (3 mm) end sensing (Enclosure must be 2 or 6)

4 HiPressure sensing - approx. .072" (2 mm) end sensing (Enclosure must be 3 and Approvals must be 2, 7, 8, or 9) (Model 73)

5 HiPressure sensing - approx. .060" (2 mm) end sensing (Enclosure must be 4 and Approvals must be 2, 7, or 8) (Model 73)

Extended Sensing Range with External Target Magnets
(See Accessories for External Target Magnets)

Outlet Position

Conduit Outlet: 1/2" NPT

5 Bottom of enclosure

Need Accessories?

See pp. 224-229 for:

Range Extending
Target Magnets
Mounting Brackets
Connectors and more!

Enclosure Material

2 303 stainless steel (rated 2,000 PSI) (Sensing must be 3)

3 HiPressure - 303 stainless steel (rated 5,000 PSI) (Sensing must be 4) (Approval must be 2, 7, 8, or 9) (Model 73)

4 HiPressure - 303 stainless steel (rated 10,000 PSI) (Sensing must be 5) (Approval must be 2, 7, 8, or 9) (Model 73)

6 316 stainless steel (rated 2,000 PSI) (Model 73)

Approvals

2 High temperature to 400°F (204°C) with Teflon™ insulated leads (Wiring must be F)

3 UL listed explosion proof for Cl I, Div 1 & 2; Grps A,B,C,D; Cl II, Div 1 & 2, Grps E-G; Cl III (Lead seal req'd within 18")

4 CSA certified explosion proof for Cl I, Div 1; Grps A,B,C,D; Cl II, Div 1; Grps E-G; Cl III (Lead seal req'd within 18")

6 CSA certified Cl I, Div 2; Grps A,B,C,D; Cl II, Div 2; Grps E-G; Cl III (Wiring must be A, B, or F) (Lead seal req'd within 18")

7 CSA certified General Purpose

8 UL listed General Purpose

9 CENELEC: EExdIIC T6 Zone 1. (EN 50 014 & EN 50 018, BASEEFA Certificate Ex89C1233X) (Wiring must be A or B)

A SAA: Ex s IIC T6 IP65; Cl I Zone 1 & 2; EX S IIC T6 IP65; Cl I Zone 0; DIP Cl II (Intrinsically safe with entity approved barrier. Install per NEC Article 501.) (Wiring must be A)

B SAA: High Temp 350°F (176°C): EX S IIC T6 IP65; Cl I Zone 1 & 2; EX S IIC T6 IP65; Cl I Zone 0; DIP Cl II (Intrinsically safe with entity approved barrier. Install per NEC Article 501.) (Wiring must be F) (Model 73)

Wiring Options

Lead Wires
Model 73 18 Gauge (.110" dia) potted-in PVC insulated AWM / TEW stranded lead wires, rated at 221°F (105°C) 600V UL / CSA listed
Model 7G 20 Gauge (.100" dia) potted-in PVC insulated AWM / TEW stranded lead wires, rated at 221°F (105°C) 300V UL / CSA listed
(Model 7G)
A2 36" (914 mm)
A3 72" (1829 mm)
A4 144" (3658 mm)
A_ _ _ Lengths greater than 144" (Specify length in feet (e.g. A150 = 150 ft. of leads))

Cable
Model 73 18 Gauge (.250" dia.) potted-in PVC cable, rated at 176°F (80°C) 300V, UL / CSA listed
Model 7G 22 Gauge (.215" dia) potted-in PVC cable, rated at 176°F (80°C) 300V, UL / CSA listed
B2 36" (914 mm)
B3 72" (1829 mm)
B4 144" (3658 mm)
B_ _ _ Lengths greater than 144" (Specify length in feet (e.g. B150 = 150 ft. of cable))

Quick Disconnect Male Quick Disconnect only, potted-in connector. (CSA requires a case ground) (Approvals must be 7 or 8) Refer to pp. 224-229 for mating cable assemblies.

Mini-change® (Model 73)		Micro-change® (Model 73)	
DCA	3 - pin Mini-change® type	**DBA**	3 - pin Micro-change® type
DCD	4 - pin Mini-change® type	**DBD**	4 - pin Micro-change® type
DCG	5 - pin Mini-change® type	**DBG**	5 - pin Micro-change® type
DCH	7 - pin Mini-change® type (Model 7G)		

SubSea Underwater Connector (Model 73)
3DD 3 pin, certified not to leak underwater
4DD 4 pin, certified not to leak underwater
3DE 3 pin right-angle, certified not to leak underwater
4DE 4 pin right-angle, certified not to leak underwater

HiTemp Leads 18 gauge (.070" dia. potted-in Teflon™ insulated leads rated at 482°F (250°C) 600V UL / CSA listed (Approval must be 2, 3, 4, 6, 7, 8 or B)
F2 36" (914 mm)
F3 72" (1829 mm)
F4 144" (3658 mm)
F_ _ _ Lengths greater than 144" (Specify length in feet (e.g. F150 = 150 ft. of leads))

Ordering Guide

Fill in the boxes to create your 'ordering number.'

Model	-	Contact Form	Sensing Range	Outlet Position	Enclosure Material	Approvals	-	Wiring Options
		1		5				

New!

Model 7L

The new GO Switch Model 7L offers the same proven internals as our other 70 Series leverless limit switches, with the addition of Red or Green BriteLite LEDs. The new 7L brings increased plant safety and awareness to the reliability of the 70 Series.

Features: 316 stainless steel enclosure
Red or Green BriteLite LEDs
Leverless Limit Switch design

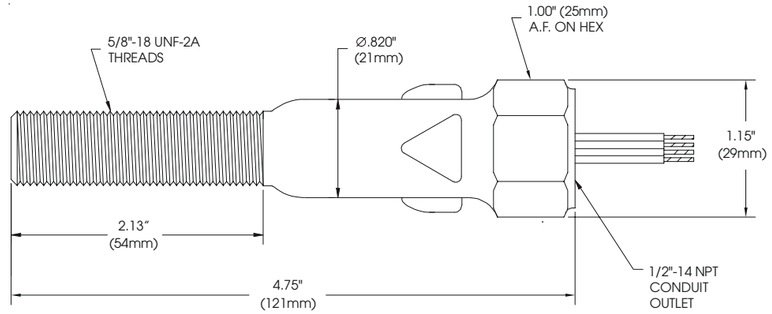
GO SWITCH inside

FAST TRACK DELIVERY

7LR-1356E-A2
Class I Div 2
Red LED, 3 ft. leads

7LG-1356E-A2
Class I Div 2
Green LED, 3 ft. leads

Dimensions



Model

Repeatability: .002" (.05 mm) typical

Response Time: 8 milliseconds

Differential: Approx. .020" (.51 mm)

Operating Temperature: -40° to 221°F (-40° to 105°C)

- **7LG** Model 7LG
  5/8" (16 mm) dia. x 4 3/4" (121 mm) long, with 5/8"-18 UNF x 2.13" (54 mm) threads and 1/2" NPT conduit hub
- **7LR** Model 7LR
  5/8" (16 mm) dia. x 4 3/4" (121 mm) long, with 5/8"-18 UNF x 2.13" (54 mm) threads and 1/2" NPT conduit hub

Contact Form

Contact Material: Palladium silver with sawtooth surface configuration

Form: SPDT, Form C

Ratings: .25A @ 24VDC/120VAC Resistive

- **1** Single Pole Double Throw (Form C)

Sensing Range

Target Material: Ferrous

Sensing Range: 0.100" nominal

- **6** Standard sensing - approx. .100" (2.5 mm) end sensing

Outlet Position

Conduit Outlet: 1/2" NPT

- **5** Bottom of enclosure

Need Accessories?

See pp. 224-229 for:

Range Extending
Target Magnets
Mounting Brackets
Connectors and more!

Enclosure Material

Stainless Steel type 316

- **6** 316 stainless steel (rated 2,000 PSI)

Approvals

c UL us

- **8** C-UL listed General Purpose
- **E** C-UL listed
  Class I, Div 2, All groups
  Class II, Div 1 & 2, All groups
  Class III

Wiring Options

Lead Wires 18 Gauge (.110" dia) potted-in PVC insulated AWM / TEW stranded lead wires, rated at 221°F (105°C) 600V UL / CSA listed

- **A2** 36" (914 mm)
- **A3** 72" (1829 mm)
- **A4** 144" (3658 mm)
- **A_ _ _** Lengths greater than 144" (Specify length in feet (e.g. A150 = 150 ft. of leads))

Cable 18 Gauge (3 cond .250" dia; 4 cond .250" dia.) potted-in PVC cable, rated at 176°F (80°C) 300V, UL / CSA listed

- **B2** 36" (914 mm)
- **B3** 72" (1829 mm)
- **B4** 144" (3658 mm)
- **B_ _ _** Lengths greater than 144" (Specify length in feet (e.g. B150 = 150 ft. of cable))

Quick Disconnect Male Quick Disconnect only, potted-in connector. (Approval must be 8) Refer to pp. 224-229 for mating cable assemblies.

Mini-change®		Micro-change®	
DCA	3 - pin Mini-change® type	**DBA**	3 - pin Micro-change® type
DCD	4 - pin Mini-change® type	**DBD**	4 - pin Micro-change® type
DCG	5 - pin Mini-change® type	**DBG**	5 - pin Micro-change® type

Ordering Guide

Fill in the boxes to create your 'ordering number.'

Model	-	Contact Form	Sensing Range	Outlet Position	Enclosure Material	Approvals	-	Wiring Options
		1	6	5	6			

Luminator LPS

502.969.8000

EXPLOSION PROOF • NON-INCENDIVE • INTRINSICALLY SAFE

LPS: Linear Position Sensor

The Luminator LPS is specifically designed to provide position feedback on linear control valves and knifegate valves. Onboard Green or Red LEDs increase safety and awareness for plant operators.

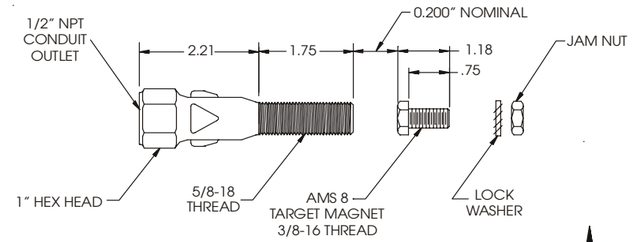
Features: 316 stainless steel enclosure
Green or Red BriteLite LEDs
Hermetically sealed sensors
Snap-action contacts

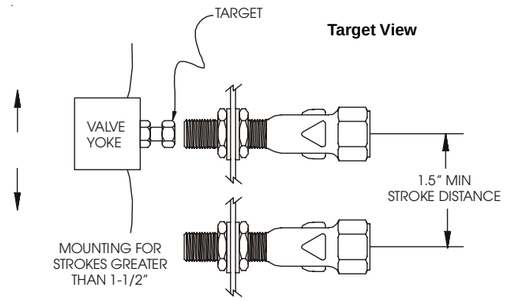
FAST TRACK DELIVERY

LPS-DZ2GA2
Zone 1 (Class 1, Div 2)
Green BriteLite

LPS-DZ2RA2
Zone 1 (Class 1, Div 2)
Red BriteLite

Dimensions





Model

Enclosure: 3.96" x 1", 316 series stainless steel

Target: 1.05" x 0.65", 316 series stainless steel

Conduit Outlet: ½" NPT

Operating Temperature: -40° to 160°F (-40°to 71°C)

Mounting: QuickMount VIP Bracket Kits. See pages 172-173 for selection.

Environment
Zone 1 (Class I, Div 1): NEMA Type 4, 4X, 7 and 9
Zone 2 (Class I, Div 2): NEMA Type 4, 4X

LPS Luminator Linear Position Sensor

Sensor

D (1) Hermetically sealed SPDT

Without BriteLite: 1A/120VAC; 0.5A/24VDC
With BriteLite: 0.25A/120VAC; 0.25A/24VDC

W (1) Hermetically sealed SPST

Without BriteLite: 3A/120VAC; 2A/24VDC
With BriteLite: 0.25A/120VAC; 0.25/24VDC

Area Classification

c UL us LISTED

CE

Z1 Explosion Proof
Zone 1
Class I, Div 1 & 2, Groups A,B,C,D
Class II, Div 1 & 2, Groups E,F,G
Class III
(Visual Display option must be N)

Z2 Non-Incendive
Zone 2
Class I, Div 2, Groups A,B,C,D
Class II, Div 1 & 2, Groups E,F,G
Class III

May be installed Intrinsically Safe per NEC Article 504.

Visual Display

BriteLite: Triaxial LEDs

BriteLite Colors: Green or Red

G Green BriteLite 360° triaxial LED visual position indicator (Z0 & Z2 only)

R Red BriteLite 360° triaxial LED visual position indicator (Z0 & Z2 only)

N No visual indication

Wiring

A2 3 ft. 18 gauge potted-in lead wires

A3 6 ft. gauge potted-in lead wires

A4 12 ft. 18 gauge potted-in lead wires

DCA 3-pin mini change quick disconnect
(Z2 only unless installed I.S. per NEC Article 504)
(Sensor option must be W)

DCD 4-pin mini change quick disconnect
(Z2 only unless installed I.S. per NEC Article 504)
(Sensor option must be W)

For wiring diagrams, see page 183.

Ordering Guide

Fill in the boxes to create your 'ordering number.'

Model		Sensor		Area Classification		Visual Display		Wiring
LPS	-							

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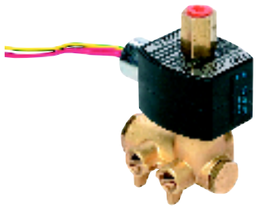
valvetop

Item	Part Number & Description

ASCO Solenoid Valves



These common solenoid valves are industry standards that can be used to automate on/off process valves. TopWorx offers 3- and 4-way flow options in standard, explosion proof, or intrinsically safe packages, with various power requirements.

General Specifications

Operating Temperature:

3-way AC	32° to 125°F (0° to 52°C)
3-way DC	32° to 104°F (0° to 40°C)
4-way	32° to 125°F (0° to 52°C)
Low Power	-4° to 140°F (-20° to 60°C)
I.S.	-4° to 140°F (-20° to 60°C)

24VDC Solenoid Valves
(10.6 to 11.1 Watt)

	Air Flow	Material	Housing
8320G202	3 way	SS	Type 4
EF8320G202	3 way	SS	Type 7
8320G184	3 way	Brass	Type 4
EF8320G184	3 way	Brass	Type 7
8345G81	4 way, 1 pilot	SS	Type 4
EV8345G81	4 way, 1 pilot	SS	Type 7
8345G1	4 way, 1 pilot	Brass	Type 4
EF8345G1	4 way, 1 pilot	Brass	Type 7
8344G80	4 way, 2 pilots	Brass	Type 4
EF8344G80	4 way, 2 pilots	Brass	Type 7

valvetop

Part Number & Description

24VDC Low Power Solenoid Valves
(1.4 Watt)

	Air Flow	Material	Housing
8316G381V	3 way	SS	Type 4
EV8316G381V	3 way	SS	Type 7
8316G301	3 way	Brass	Type 4
EF8316G301	3 way	Brass	Type 7
EV8345G381	4 way, 1 pilot	SS	Type 7
8344G370	4 way, 1 pilot	Brass	Type 4
EF8344G370	4 way, 1 pilot	Brass	Type 7
8551G355	4 way, 2 pilots	SS	Type 4
EV8551G355	4 way, 2 pilots	SS	Type 7
8344G344	4 way, 2 pilots	Brass	Type 4
EF8344G344	4 way, 2 pilots	Brass	Type 7

Part Number & Description

24VDC Intrinsically Safe Solenoid Valves
(0.46 Watt nominal)

	Air Flow	Material	Housing
WSIS8316A381V	3 way	SS	Type 4
WPIS8316A301	3 way	Brass	Type 4
WSIS8345A381	4 way, 1 pilot	SS	Type 4
WPIS8344A370	4 way, 1 pilot	Brass	Type 4
WPIS8344A344	4 way, 2 pilots	Brass	Type 4

120VAC Solenoid Valves
(20.1 Watt)

	Air Flow	Material	Housing
8342G701	3 way	SS	Type 4
EF8342G701	3 way	SS	Type 7
8342G1	3 way	Brass	Type 4
EF8342G1	3 way	Brass	Type 7

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valvetop

Item	Part Number & Description	
Air Filter Regulator	**AL-M41**	Filter regulator with automatic drain and pressure gauge - Bracket included

Good quality air is essential for the proper operation of Discrete Valve Controllers, pneumatic solenoid valves, and pneumatic actuators. TopWorx recommends these filter regulators in environments where clean, dry air is not available.

General Specifications

Operating Temperature: 23° to 140°F (-5° to 60°C)

Port Size: 1/4" NPT

Max. Operating pressure psig: 150 (1.0MPa)

Filtration: 5 µm

Wiring Kits

These Wiring Kits provide an easy way to wire TopWorx spool valves with pneumatic valve pilot electrical connections.

Note: Conduit Box Entry option "T" is for use with TopWorx HazLink I/O (pages 38, 58, 76, 96 & 112) and option "H" is for use with TopWorx Discrete Valve Monitors (pages 130-134 & 140-143).

Create your Wiring Kit part number by selecting the number of pilots, conduit box entry size, and wire protection needed for your application.

Example
WK-1TC = Wiring kit with one pilot, 3/4" conduit box entry, and cable gland wire protection.

Wiring Kit	No. of Pilots*	Conduit Box Entry	Wire Protection
WK-	**1** One	**T** 3/4"	**L** Liquid Tight IP65, NEMA 4x
	2 Two	**H** 1/2"	**C** Cable gland

* Pilot = electro-pneumatic operator

valvetop

Item	Part Number & Description	
Non-NAMUR Interface Plate	**Z001205**	Non-NAMUR Interface Plate

This Interface Plate enables easy adaptation of Lumitech NAMUR mount valve position controllers and monitors to non-NAMUR actuator brackets.

Materials: 1/4" thick stainless steel plate and stainless steel intermediate shaft with bronze bushing.

Flow Controls	**AL-M20**	Flow controls, 1/8" NPT (2 per kit)
	AL-M21	Flow controls, 1/4" NPT (2 per kit)

These stainless steel flow controls provide a means to adjust the speed of operation and the air exhaust rate of a pneumatic actuator. Breathers within the flow controls quiet the actuator's exhaust air and provide some protection against debris entering the air valve ports.

Breathers	**AL-M30**	Breathers, 1/8" NPT (2 per kit)
	AL-M31	Breathers, 1/4" NPT (2 per kit)

These plastic breathers quiet an actuator's exhaust air and provide protection against debris entering the air valve ports.

1A Fuse Kit	**ND601**	1A fuse kit (10 pcs.)

This 1 amp circuit board fuse kit provides replacement fuses for devices that feature TopWorx DeviceNet Sensor-Communications Modules (SCM-DN), including the DVC-DN, DVM-DN, DXP-DN, DXS-DN, and HazLink.

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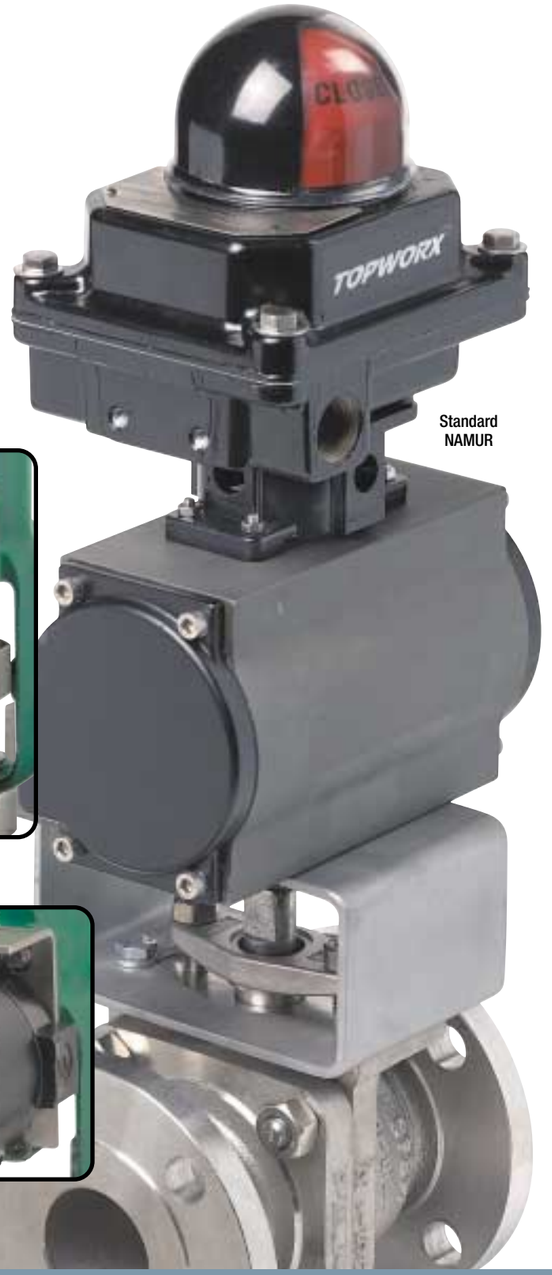
Mounting Kits

valvetop Over the years, customers have asked us to mount our valve controllers and monitors to just about every type and brand of valve and actuator on the planet.

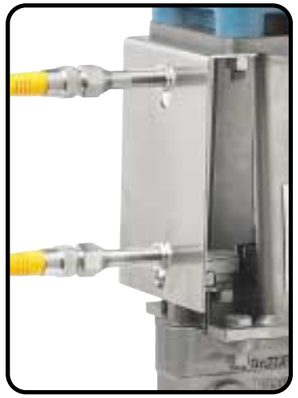
As a result, TopWorx has amassed over 1,200 different mounting kit designs.

So whether your valve application is rotary or linear, NAMUR or non-NAMUR, in production or obsolete, TopWorx is sure to have a mounting kit that fits your need.

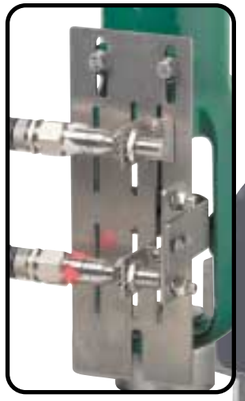
Stainless Steel NAMUR



Standard NAMUR



Knifegate Valves



Control Valves

Rotary Vane Actuators

Control Valves

VIP Mounting Kits

NAMUR Mounting Kits

The vast majority of rack and pinion valve actuators come with an ISO/NAMUR mounting pattern. This worldwide standard provides a consistent bolt pattern and shaft height regardless of the actuator brand. As a result, there is less need for expensive, custom made mounting kits, making it easier and less expensive to mount topworks accessories.

TopWorx offers several cast aluminum and stainless steel mounting kits that make it easy to attach our products to rack and pinion actuators.

Note: TopWorx Lumitech discrete valve controllers take full advantage of the ISO/NAMUR standard. They are uniquely designed to attach directly to any rack and pinion actuator WITHOUT mounting kits! This eliminates the hassle and expense of purchasing and installing mounting kits - saving time, money, and space.

Custom (Non-NAMUR) Mounting Kits

Rotary valve actuators that do not use the ISO/NAMUR standard, such as scotch-yoke or vane actuators, require custom designed mounting kits to attach topworks accessories.

This can be a complex procedure that should not be overlooked by the end user. Since there are no standards, it is more difficult to ensure the proper fit and function of brackets, and consequently the automated valve system itself.

TopWorx has a team of designers experienced at solving this problem, making it easy to mount our products to scotch-yoke and vane actuators. With an existing library of over 1,200 different designs, there is probably already a design ready for your application.

Note: TopWorx custom mounting kits are always made of heavy-gauge stainless steel, ensuring the proper amount of support in the field.

Linear Valve Mounting Kits

Linear valves, such as control valves, globe valves, knifegate valves, or diaphragm valves, do not conform to any standard mounting patterns. Therefore, custom designed mounting kits are necessary to attach valve position monitors and sensors.

Since TopWorx has been mounting GO Switches onto linear valves and actuators for several decades, there is probably already a design ready for your application - if not, we will create one.

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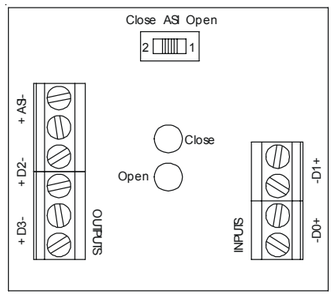
AS-Interface Sensor-Communications Module (SCM) Layout

DVC-AS, DVM-AS
DXP-AS, DXS-AS

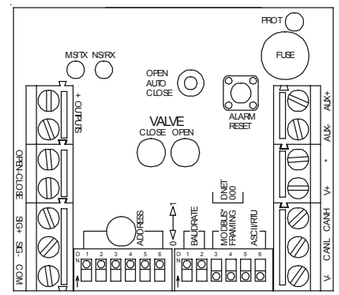


AS-Interface SCM Specifications

Electrical Specifications		
Device ID **Device I/O**	0 Free Profile 3 2 inputs/2 outputs	
Inputs	D0 Closed limit switch D1 Open limit switch	0 Switch open 1 Switch closed
Outputs	D2 Solenoid #1 (open) D3 Solenoid #2 (closed)	0 De-energize solenoid 1 Energize solenoid
Current	DVC max current = 65mA DVM (40mA + open solenoid current + closed solenoid current) max solenoid current = 170mA	

DeviceNet Sensor-Communications Module (SCM) Layout

DVC-DN, DVM-DN
DXP-DN, DXS-DN

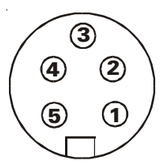


DeviceNet SCM Specifications

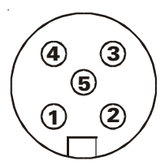
Electrical Specifications	
Voltage	24VDC
Cube Current	45mA + solenoid
Max. Solenoid Current	0.5A
Protection	1A fuse

DeviceNet Quick Disconnect Connector Wiring Diagram (DVC & DVM only)

The DVC-DN and DVM-DN connect to a DeviceNet trunk line or drop line using a standard 5-in round mini or micro male (with pins) connector, as shown below.



Mini Connector Male View

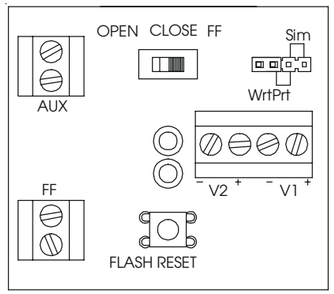


Micro Connector Male View

PIN 1 = Not connected
PIN 2 = V+
PIN 3 = V-
PIN 4 = CANH
PIN 5 = CANL

FOUNDATION Fieldbus Sensor-Communications Module (SCM) Layout

DVC-FF, DVM-FF
DXP-FF, DXS-FF

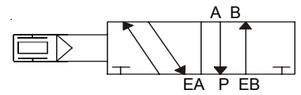


FOUNDATION Fieldbus Specifications

Electrical Specifications	
Function Block Execution Times	DO 60mS DI 60mS
Valve Drivers	6VDC with 500Ω series load output
Current Consumption	LEDs disabled <17mA LEDs enabled <22mA
Maximum Applied Voltage	35DC
Operating Voltage	9-32VDC
FM Approved Entity Parameters	
Vmax	24V
Imax	250mA
Ci	2.5nF
Li	192uH
Pmax	1.2W

FOUNDATION Fieldbus DVC-FF Integral Piezo Pilot Valve

Pneumatic Drawing



DVC-FF Integrated Piezo Pilot Valve Specifications			
Fluid	Air, Inert Gas	**Flow Coefficient (Cv)**	1.2 (Bare valve)
Max. Operating Pressure	100 PSI (0.7 MPa)	**Weight with fittings & bracket**	0.42 lb.
Min. Operating Pressure	22 PSI (0.15 MPa)	**Mounting**	None required - integrated
Lubrication	None required	**NEMA Rating**	Designed to meet 4, 4X - dust tight, weatherproof
Pilot Operator Manual Override	Non-locking push type (flush)	**Temperature**	14° to 122°F (-10° to 50°C)
Port Size	1/4" NPT (supply & work); 1/8" (exhaust)	**Filtration**	3-5 micron point-of-use

FOUNDATION Fieldbus DVM-FF Piezo Pilot Valves

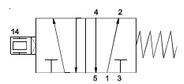
A TopWorx bolt-on or NAMUR mount pilot valve is required for DVM-FF models. Care should be taken to order the correct pilot valve for applications that require the valve to fail in a certain position on loss of air.

One of the following models should be ordered to accompany all DVM-FF models:

Single Piezo Pilot Valves

LP2-Z0P44 Single pilot NAMUR mount valve; fail full open or full close

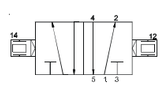
LP2-Z0P64 Single pilot bolt mount valve; fail full open or full close



Dual Piezo Pilot Valves

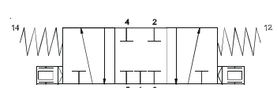
LP2-Z0Q44 Dual pilot NAMUR mount valve; fail in last position

LP2-Z0Q64 Dual pilot bolt mount valve; fail in last position



Block Center Dribble Control Piezo Pilot Valve

LP2-Z0R64 Dual pilot bolt mount block center valve; fail in place



DVM-FF Piezo Pilot Valve Specifications	
Mounting	2 screws M5
Port size	1/4" NPT
Weight	Single Pilot - 1.2 lbs, Dual Pilot - 1.4 lbs
Installation	Mountable in any position
Ambient Temperature	14° to 140°F (-10° to 60°C)
Pneumatic	
Operating Pressure Range	37 to 145 PSI
Nominal Flow	1.3 Cv
Electrical	
Nominal Current	1.3mA
Switching Voltage	4.2 to 9V
Duty Cycle	100%
Electrical Protection	IP54
Connection	Plug to DIN 43650B - industry norm

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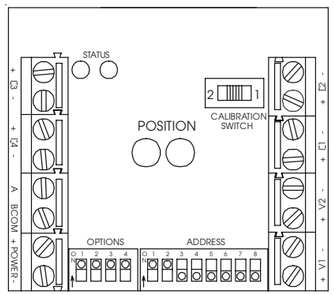
Profibus DP DVC, DVM, DXP & DXS

502.969.8000

Profibus DP Sensor-Communications Module (SCM) Layout

DVC-PB, DVM-PB
DXP-PB, DXS-PB



Profibus DP SCM Specifications

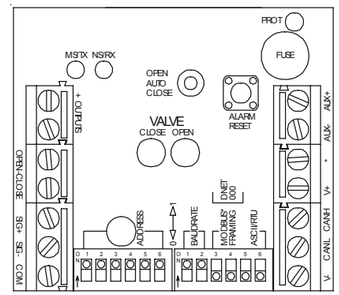
Electrical Specifications	
Max. Solenoid Power	12 Watts
Operating Voltage	24V ± 10%
Current	< 100mA + solenoid power
Short Circuit Protection	Fused input power
Addressing	Dip switch selected
Additional Features	Calibration switch; open and close timers and time out alarms; cycle counter and cycle count alarm; 2 auxilliary inputs; local LED feedback for board status; board position

Modbus DVC, DVM, DXP & DXS

TOPWORX

Modbus Sensor-Communications Module (SCM) Layout

DVC-MB, DVM-MB
DXP-MB, DXS-MB



Modbus SCM Specifications

Electrical Specifications	
Voltage	24VDC
Cube Current	45mA + solenoid
Max. Solenoid Current	0.5A
Protection	1A fuse

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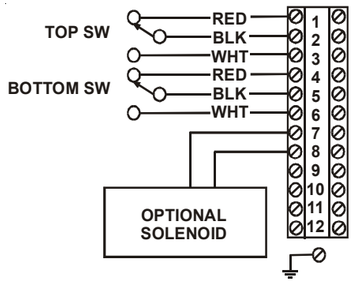
IVC & IVM Wiring Diagram

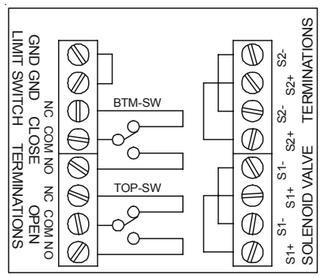
Sensor option G2



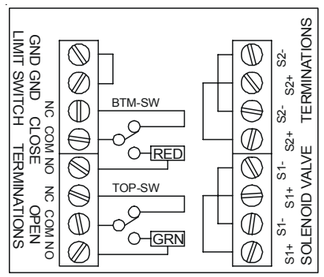
Option G2
(2) SPDT GO Switches

IVC & IVM Circuit Board Wiring Diagrams

Sensor option D2



Circuit Board Wiring
without BriteLite



Circuit Board Wiring
with BriteLite

Lumitech

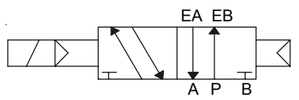
IVC Spool Valve Specifications

Valve Specifications	
Fluid	Air, Inert Gas
Max. Operating Pressure	100 PSI (0.7 MPa)
Min. Operating Pressure	22 PSI (0.15 MPa)
Lubrication	None required
Pilot Operator Manual Override	Non-locking push type (flush)
Port Size	1/4" NPT (supply & work); 1/8" (exhaust)
Flow Coefficient (Cv)	1.2 (Bare valve)
Weight with fittings & bracket	0.42 lb.
Mounting	None required - integrated
NEMA Rating	Designed to meet 4, 4X - dust tight, weatherproof
Temperature	14° to 122°F (-10° to 50°C)

IVC Coil Electrical Specifications

IVC Coil Electrical Specifications	
Rated AC Voltage	115V (50/60 Hz)
Rated DC Voltage	24V
Allowable Voltage Range	+/- 10% of rated voltage
Coil Insulation	Class B
Power Consumption (AC)	1.2 VA (60 Hz)
Power Consumption (DC)	0.6 Watts

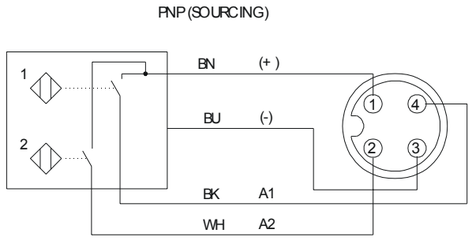
IVC Pneumatic Drawing



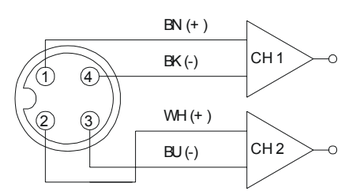
Lumitech

PPS Puck Position Sensor Wiring Diagrams

Sensor Option 3S
DC 3-wire inductive sensors

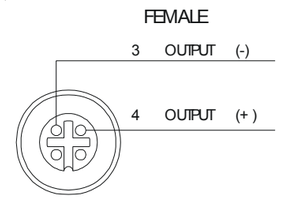


Sensor Option NS
Intrinsically safe inductive sensors

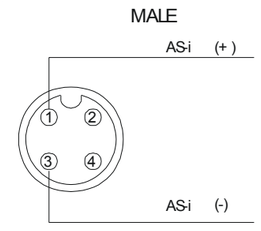


SHORT-CIRCUIT AND OVERLOAD PROTECTED

Sensor Option AS
AS-Interface & inductive sensors



SHORT-CIRCUIT AND OVERLOAD PROTECTED

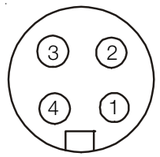


SHORT-CIRCUIT AND OVERLOAD PROTECTED

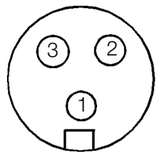
Lumitech

LPS Wiring Diagrams

Wiring options DCA and DCD
3-pin and 4-pin mini change connector (available with Sensor option W only)



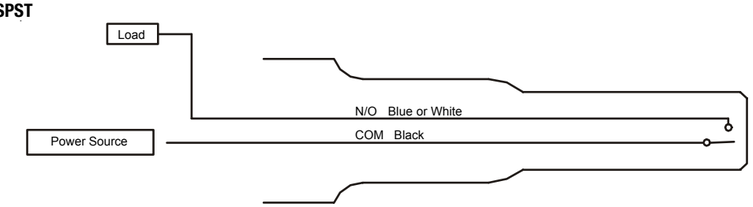
PIN 1 = COM - Black
PIN 2 = N/O - White
PIN 3 = N/C - Red
PIN 4 = GND - Green



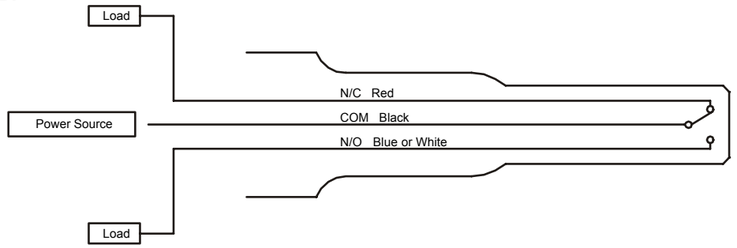
PIN 1 = GND - Green
PIN 2 = Black
PIN 3 = N/O - White

LPS Schematic Drawings

SPST



SPDT



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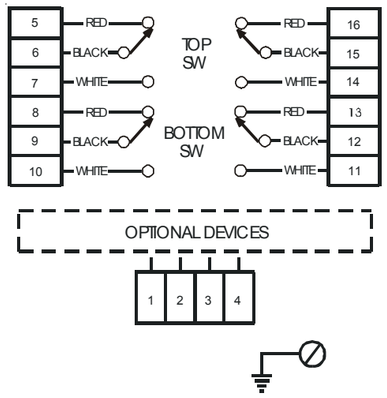
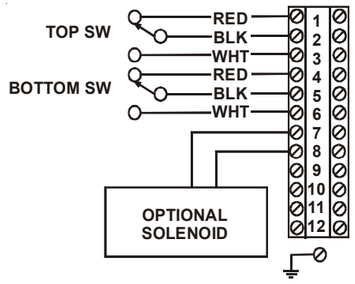
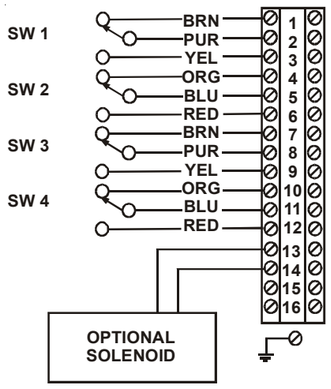
SWITCHPAK



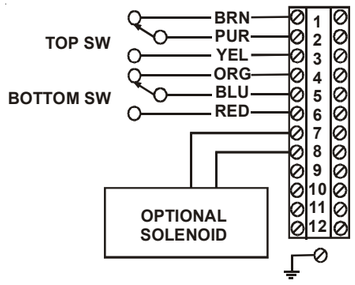
Option L4
(4) SPDT GO Switches
(SSP, SRP)



Option L2
(2) SPDT GO Switches
(SSP, SXP, SXS, SRP, SBP)

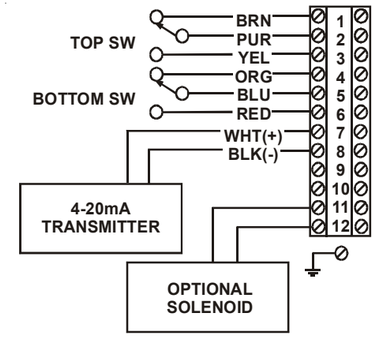


Option M4
(4) SPDT Mechanical Switches
(SSP, SXP, SXS, SRP)

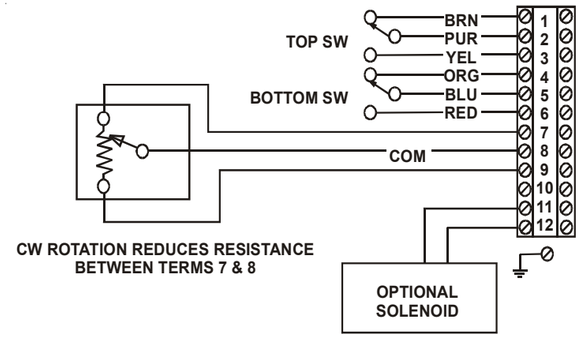


Option M2
(2) SPDT Mechanical Switches
(SSP, SXP, SXS, SRP, SUP, SEP)

SWITCHPAK



Option M2 with Analog Output option 42
(2) SPDT Mechanical Switches
with 4-20mA Transmitter
(SSP, SXP, SXS, SRP)



Option M2 with Analog Output option 01 or 10
(2) SPDT Mechanical Switches
with 1K or 10K ohm potentiometer
(SSP, SXP, SXS, SRP)

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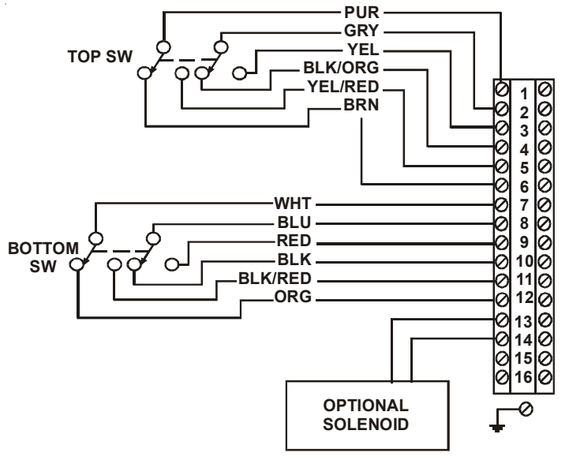
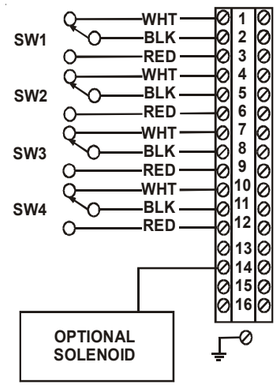
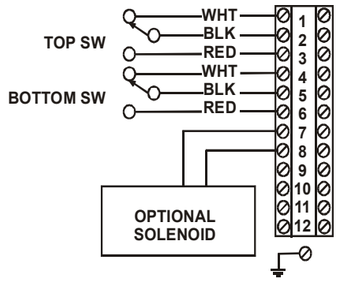
SWITCHPAK



Option T2
(2) DPDT Mechanical Switches
(SSP, SXP, SXS, SRP, SEP)

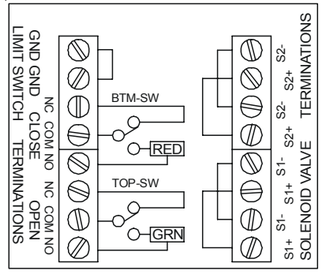


Option D4
(4) SPDT Hermetically Sealed Switches
(SSP, SRP)

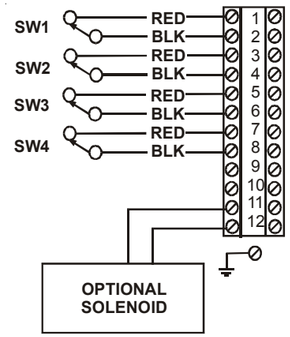


Option D2
(2) SPDT Hermetically Sealed Switches
(SSP, SRP, SEP, SBP)

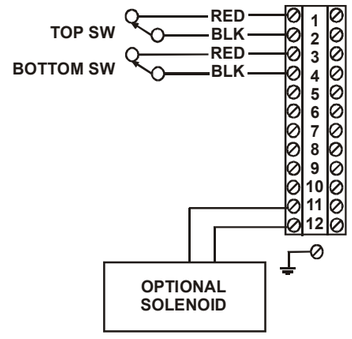
SWITCHPAK



Option D2
(2) SPDT Hermetically Sealed Switches
(SXP, SXS)



Option W4
(4) SPST Hermetically Sealed Switches
(SSP, SRP)



Option W2
(2) SPST Hermetically Sealed Switches
(SSP, SRP, SEP, SBP)

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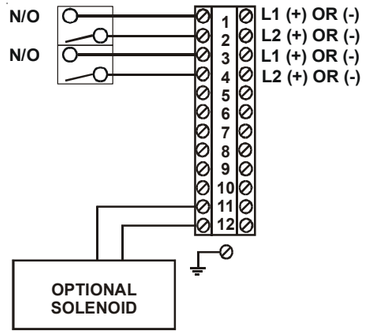
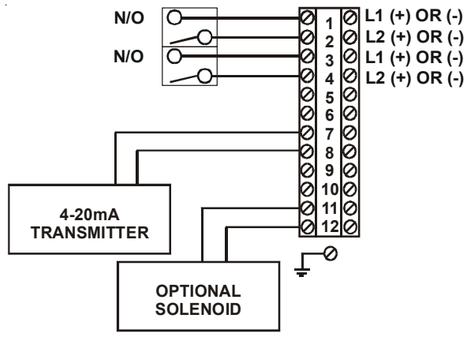
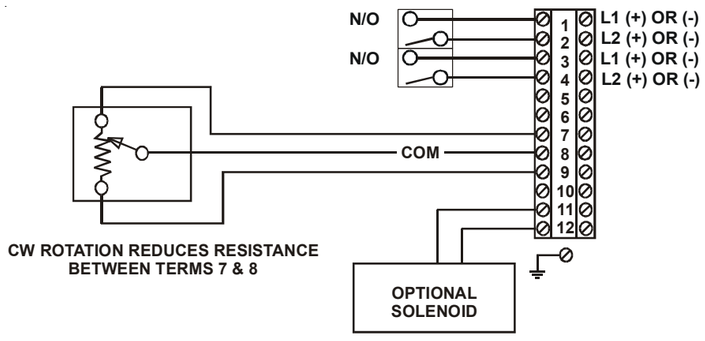
SWITCHPAK



Option E2
(2) Pepperl + Fuchs NJ2-V3-N Switches
(SXP, SXS, SUP)

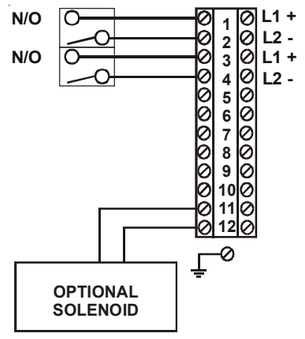


Option E2 with Analog Output option 42
(2) Pepperl + Fuchs NJ2-V3-N Switches
with 4-20mA Transmitter
(SXP, SXS)

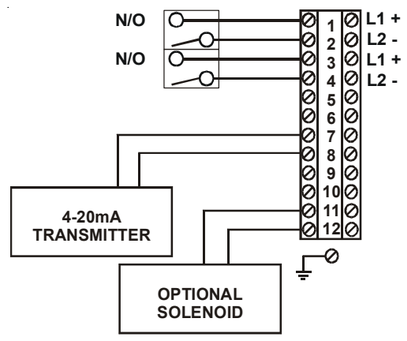


Option E2 with Analog Output option 01 or 10
(2) Pepperl + Fuchs NJ2-V3-N Switches
with 1K or 10K ohm potentiometer
(SXP, SXS)

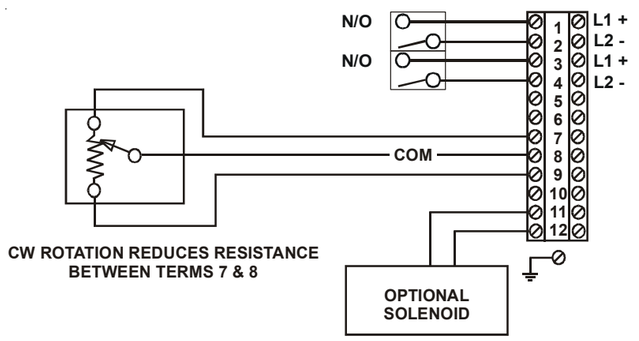
SWITCHPAK



Option F2 & P2
(2) P+F NJ2-11-SN-G switches (F2) or
(2) Inductive non-NAMUR sensors (P2)
(SXP, SXS)



Option F2 & P2 with Analog Output option 42
(2) P+F NJ2-11-SN-G switches (F2) or
(2) Inductive non-NAMUR sensors (P2)
with 4-20mA Transmitter
(SXP, SXS)



Option F2 and P2 with Analog Output option 01 or 10
(2) P+F NJ2-11-SN-G switches (F2) or
(2) Inductive non-NAMUR sensors (P2)
with 1K or 10K ohm potentiometer
(SXP, SXS)

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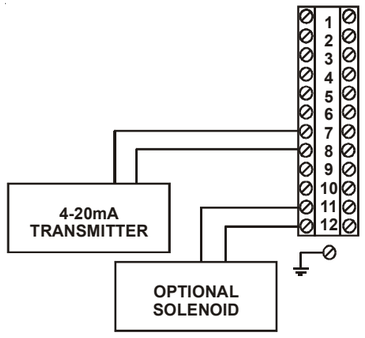
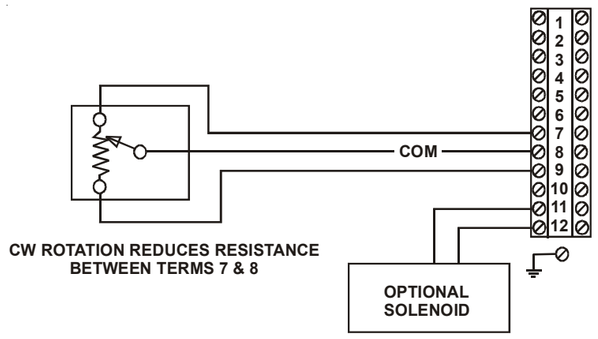
SWITCHPAK



Analog Output Option 42 with no sensors
(SSP, SXP, SXS, SRP)



Analog Output option 01 or 10 with no sensors
(SSP, SXP, SXS, SRP)

SWITCHPAK

Potting Compartment

Within the housing at the conduit entries are two potting compartments available for factory sealed leads. They are designed to UL and CSA specifications, eliminating the need to add a sealed potting compartment within 18" of the Switchpak. Sealing of these compartments in the filed also prevents moisture ingression through the conduit.

O-rings

Standard O-rings are Buna-N and are acceptable for most applications. Viton O-rings are available for areas with high heat, moisture, and corrosion. All Switchpaks have O-ring seals between the uppers and lower switch housing, at each end of the shaft, and under the outer dome.

Buna-N: Nitrile rubber
-65° to 275°F (-53° to 135°C)

Viton: Fluorocarbon rubber
-15° to 400°F (-26° to 204°C)

Visual Indication

- Dome shape provides superior strength
- Snap on design for fast, precise 360° adjustment to actual valve position
- Impact resistant Lexan polycarbonate material
- EaStar material optional
- O-ring sealed from moisture and contamination
- Highly visible Green/Red, Open/Closed indication eliminates guesswork
- Custom text options available
- 3-way valve indication available

Shafts and Cams

Adjustment cams allow switch positions to be quickly set to valve position.

Shafts are 300 series stainless steel with stainless steel retaining rings top and bottom and are O-ring sealed though bronze/composite Teflon bearings. O-rings are standard Buna-N with Viton optional.

Shafts are available in NAMUR or standard configuration. NAMUR shaft mates directly with NAMUR actuator output shafts without couplers.

Cams are molded Nylon-6 on 4° splines and spring-loaded for easy calibration. Target magnet inserts are used for prox switch options.

A precision gear is mated to the shaft for 4-20mA transmitter and potentiometer options.

Terminal Strips

A pre-wired, 12-point numbered terminal strip is standard for most options. There are two open contacts for an integral solenoid valve connection in all Switchpaks.

- Standard 12-point terminal strip is Nylon Euro style
- Terminal strip will receive maximum 14AWG wire
- Terminal screws and contacts are nickel-plated brass
- A minimum of two terminals are available for accessory mounting with any switch option

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SWITCHPAK

GO Switch - Model 35
Sensor options L2 & L4
(SSP, SXP, SXS, SRP, SBP)

The model 35 GO Switch features large contacts with a snap action to switch heavy loads. Model 35 Switches are gold flashed with a built-in wiping action and high contact pressure to switch low loads. All this and hermetic sealing to maintain a clean, dry atmosphere make the Model 35 GO Switch the top choice for critical processes.

Contacts: SPDT, Form C. Silver cadmium oxide, gold flashed.

Contact chamber: Hermetically sealed

Response time: 8 milliseconds

Temperature rating: -40° to 221°F (-40 to 105°C)

AC		DC	
Volts	Amps	Volts	Amps
120	4	24	3
240	2	48	1
480	*	125	0.5
		250	*

Housing: Copper/black lacquer

Repeatability: .002" (.05 mm) typical

Differential: 5/32" (4 mm)

Approvals: UL listed and CSA certified

Proximity Sensors
Sensor options W2, W4, D2 & D4

The double-hinged design and snap action make this switch excellent for high and low current applications. It is literally the best reed available.

Contact chamber: Hermetically sealed

Temperature rating: -40° to 180°F (-40 to 82°C)

Tube atmosphere: Vacuum

<u>SPST - Bifurcated</u>
Sensor options W2 & W4
(SSP, SRP, SEP, SBP)

Contacts: SPST, Form A. Silver cadmium oxide;
3.0A/120VAC; 0.5A/24VDC

<u>SPDT</u>
Sensor options D2 & D4
(SSP, SXP, SXS, SRP, SEP, SBP)

Contacts: SPDT, Form C. Silver cadmium oxide;
1.0A/120VAC; 0.5A/24VDC

SWITCHPAK

Proximity Sensors
Sensor options E2, F2 & P2

<u>Pepperl + Fuchs NJ2-V3-N</u>
Sensor option E2
(SXP, SXS, SUP only)

V3 proximity, 2 wire, non-amplified NAMUR
EExia IIC certified

Protection: IP67
Voltage Range: 0 to 25VDC
Housing Material: PBT/PPS
Operating Distance: 2 mm

<u>Pepperl + Fuchs NJ2-11-SN-G</u>
Sensor option F2
(SXP, SXS only)

Protection: IP68
Voltage Range: 5 to 25VDC
Housing Material: High grade steel
Sensing face: PBT
Operating Distance: 2 mm

<u>Inductive Non-NAMUR Sensors</u>
Sensor option P2
(SXP, SXS only)

Voltage Range: 10 to 30VDC
Operating Distance: 5 mm

Mechanical Switches
Sensor options M2, M4 & T2

- Economical
- SPDT and DPDT contacts
- High current carrying capability
- Temperature rating: -40° to 300°F (-40 to 148°C)
- UL reconized and CSA certified

<u>SPDT</u>
Sensor options M2, M3 & M4
(SSP, SXP, SXS, SRP, SUP, SEP)

Contacts: SPDT, Form C

- 15A/125VAC, 0.5 HP
- 10A/250VAC
- 0.5A/125VDC
- 0.25A/250VDC

<u>DPDT</u>
Sensor option T2
(SSP, SXP, SXS, SRP, SEP)

Contacts: DPDT, 2 Form C

- 15A/125VAC, 0.75 HP

Reference Material

NEMA Definitions

Type 1	General Purpose	indoor	accidential contact (cage or skeleton) will not rust
Type 2	Drip-proof	indoor	limited amounts of falling water and dirt (not dust-tight) will not rust
Type 3	Dust-tight, rain-tight	outdoor	windblown dust, rain, sleet, and undamaged by external ice formation
Type 3R	Dust-tight, rain-tight	outdoor	same as type 3 above, plus diverts water from live parts, provision for drainage, will not rust
Type 3S	Dust-tight, rain-tight	outdoor	same as type 3 above, operation of external mechanism when ice laden, will not rust
Type 4	Water-tight/dust-tight	indoor/ outdoor	windblown dust and rain, splashing water, and hose directed water, undamanged by ice formation, will not rust
Type 5	Dust-tight	indoor	dust and falling direct, will not rust
Type 6	Water-tight, dust-tight	indoor/ outdoor	temporary entry of water during limited submersion (6 ft. for 30 min), undamaged by formation of ice, will not rust
Type 6P	Water-tight/dust-tight	indoor/ outdoor	same as type 6 above plus prolonged submersion at 6 psig, will not rust
Type 7	Explosion proof Cl I, Gps A, B, C, D	indoor	Hazardous locations: protection against corrosive effects of liquids and gases
Type 8	Explosion proof Cl I, Gps A, B, C, D	indoor/ outdoor	Hazardous locations: protection against corrosive effects of liquids and gases; contacts or connections immersed in oil
Type 9	Explosion proof Cl II, Gps E or G	indoor	Hazardous locations: dust-tight, hazardous dust
Type 10	Hazardous Locations	indoor	(MSHA) Mine Safety and Health Adm. per 30 C.F.R., Part 18
Type 11	Oil-tight/Corrosion	indoor	protection from corrosive effects of gases and liquid dripping, seepage and external condensation of corrosives, oil immersion
Type 12	Oil-tight/Dust-tight	indoor	fibers, lint, dust and light splashing, seeage, and dripping condensation of non-corrosive liquids
Type 12K	Oil-tight/Dust-tight	indoor	same as type 12 above, enclosure has knockouts
Type 13	Oil-tight/Dust-tight	indoor	dust, spraying of water, oil and corrosive coolant, oil resistant gaskets

Enclosure Rating Descriptions

NEMA, UL & CSA type rating	Approximate IEC/IP classification	Abbreviated protection description
1	IP23	Indoor protection from contact with contents
2	IP30	Indoor with limited protection from dirt & water
3	IP64	Outdoor with some protection from rain, sleet, windblown dust & ice damage
3R	IP32	Outdoor with some protection from rain, sleet & ice damage
4	IP66	Indoor and outdoor with some protection from windblown dust, rain, splashing water, hose-directed water & ice damage
4X	IP66	Indoor and outdoor with some protection from corrosion, windblown dust, rain, splashing water, hose-directed water & ice damage
6	IP67	Indoor and outdoor with some protection from hose-directed water, entry of water during submersion at limited depth & ice damage
12	IP55	Indoor with protection from dust, falling dirt & dripping non-corrosive liquids
13	IP65	Indoor protection against dust, spraying water, oil & non-corrosive liquids

Source: Control Engineering, March 1999

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Approval Agencies

These groups define the options or approvals that may be required for a particular application. Safety requirements, the demands of the machinery on which the product will be used, or the type of environment will all play a role in determining the type of approval needed.

UL D	**Underwriters Laboratories (UL)** **DEMCO** (Subsidiary of UL)	Our file number is E79070 for hazardous location switches and E81878 for general purpose switches. Our file number for Switchpak and Lumitech products is E125326. Our file number for the LPS is E79070.
MSHA	**Mine Safety and Health Administration (MSHA)**	Our file number is X/P-1504-1 November 20, 1984.
FM APPROVED	**Factory Mutual (FM)**	Factory Mutual approved switches are listed in the Factory Mutual Approved Guide. Our file number for the DVC-FF is 3010217.
CSA	**Canadian Standard Association (CSA)**	Our file number is LR-24226, (CSA) which includes most GO® Switches except special models.
	Standards Association of Australia (SAA)	Our file number is EL/29:78062/M90 Ex109.
Ex BASEEFA	**British Approvals Service for Electrical Equipment in Flammable Atmospheres (BASEEFA) (Cenelec)**	Our file number is Ex 89C1233X for use in Zone 1 Hazardous areas.

UL Hazardous Locations

Class I
Flammable Gases, Vapors or Liquids
Class I Area Classification

Division 1:
Where ignitable concentrations of flammable gases, vapors, or liquids can exist all of the time or some of the time under normal operating conditions.

Zone 0:
Where ignitable concentrations of flammable gases, vapors or liquids can exist all of the time or long periods of time under normal operating conditions.

Zone 1:
Where ignitable concentrations of flammable gases, vapors or liquids can exist some of the time under normal operating conditions.

Division 2:
Where ignitable concentrations of flammable gases, vapors or liquids are not likely to exist under normal operating conditions.

Zone 2:
Where ignitable concentrations of flammable gases, vapors, or liquids are not likely to exist under normal operating conditions.

Class II
Combustible Dusts
Class II Area Classification

Division 1:
Where ignitable concentrations of combustible dusts can exist all of the time or some of the time under normal operating conditions.

Division 2:
Where ignitable concentrations of combustible dusts are not likely to exist under normal operating conditions.

Class III
Ignitable Fibers & Flyings
Class III Area Classification

Division 1:
Where easily ignitable fibers or materials producing combustible flyings are handled, manufactured or used.

Division 2:
Where easily ignitable fibers are stored or handled.

Class I Groups

Division 1 & 2
A (acetylene)

B (hydrogen)
C (ethylene)
D (propane)

Zone 0, 1 & 2
IIC (acetylene & hydrogen)

IIB (ethylene)
IIA (propane)

Class II Groups

Division 1 & 2
E (metals - Div. 1 only)
F (coal)
G (grain)

Class III Groups

Division 1 & 2
None.

Class I Temperature Codes

Division 1 & 2

T1 (≤ 450°C)
T2 (≤ 300°C)
T2A, T2B, T2C, T2D (≤ 280°C, ≤ 260°C, ≤ 230°C, ≤ 215°C)
T3 (≤ 200°C)
T3A, T3B, T3C (≤ 180°C, ≤ 165°C, ≤ 160°C)
T4 (≤ 135°C)
T4A (≤ 120°C)
T5 (≤ 100°C)
T6 (≤ 85°C)

Zone 0, 1 & 2

T1 (≤ 450°C)
T2 (≤ 300°C)

T3 (≤ 200°C)

T4 (≤ 135°C)

T5 (≤ 100°C)
T6 (≤ 85°C)

Class II Temperature Codes

Division 1 & 2

T1 (≤ 450°C)
T2 (≤ 300°C)
T2A, T2B, T2C, T2D (≤ 280°C, ≤ 260°C, ≤ 230°C, ≤ 215°C)

T3 (≤ 200°C)
T3A, T3B, T3C (≤ 180°C, ≤ 165°C, ≤ 160°C)
T4 (≤ 135°C)
T4A (≤ 120°C)
T5 (≤ 100°C)
T6 (≤ 85°C)

Class III Temperature Codes

Division 1 & 2

T3B, T3C (≤ 165°C, ≤ 160°C)
T4 (≤ 135°C)
T4A (≤ 120°C)
T5 (≤ 100°C)
T6 (≤ 85°C)

Note: Article 503 of the NEC limits the maximum temperature codes for Class III equipment to 165°C for equipment not subject to overloading and to 120°C for equipment that may be overloaded.

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UL Hazardous Locations

Class I, Division 1 & 2 Protection Methods

		Applicable Certification Documents	
Area	**Protection**	**U.S.**	**Canada**
Division 1	Explosion proof	UL 1203	CSA-30
	Intrinsically safe (2 fault)	UL 913	CSA-157
	Purged/pressurized (Type X or Y)	NFPA 496	NFPA 496
Division 2	Non-incendive	UL 1604	CSA-213
	Non-sparking device	UL 1604	CSA-213
	Purged/pressurized (Type Z)	NFPA 496	NFPA 496
	Hermetically sealed	UL 1604	CSA 213
	Any Class I, Div. 1 method	---	---
	Any Class I, Zone 1 or 2 method	---	---

Class I, Zone 0, 1 & 2 Protection Methods

		Applicable Certification Documents			
Area	**Protection**	**U.S.**	**Canada**	**IEC**	**Europe**
Zone 0	Intrinsically safe, 'ia' (2 fault)	UL 2279, Pt. 11	CSA-E79-11	IEC 60079-11	EN50020
	Class I, Div. 2 Intrinsically safe, (2 fault) method	UL 913	CSA-157	---	---
Zone 1	Encapsulation, 'm'	UL 2279, Pt. 18	CSA-E79-18	IEC 60079-18	EN 50028
	Flameproof, 'd'	UL 2279, Pt. 1	CSA-E79-1	IEC 60079-1	EN 50018
	Increased safety, 'e'	UL 2279, Pt. 7	CSA-E79-7	IEC 60079-7	EN 50019
	Intrinsically safe, 'ib' (1 fault)	UL 2279, Pt. 11	CSA-E79-11	IEC 60079-11	EN 50020
	Oil immersion, 'o'	UL 2279, Pt. 6	CSA-E79-6	IEC 60079-6	EN 50015
	Powder filling, 'q'	UL 2279, Pt. 5	CSA-E79-5	IEC 60079-5	EN 50017
	Purged/pressurized, 'p'	---	CSA-E79-2	IEC 60079-2	EN 50016
	Any Class I, Zone 0 method	---	---	---	---
	Any Class I, Div. 1 method	---	---	---	---
Zone 2	Non-incendive, 'nC'	UL 2279, Pt. 15	CSA-E79-15	IEC 60079-15	pr EN 50021
	Non-sparking device, 'nA'	2279, Pt. 15	CSA-E79-15	IEC 60079-15	pr EN 50021
	Restricted breathing, 'nR'	UL 2279, Pt. 15	CSA-E79-15	IEC 60079-15	pr EN 50021
	Hermetically Sealed, 'nC'	UL 2279, Pt. 15	CSA-E79-15	IEC 60079-15	pr EN 50021
	Any Class I, Zone 0 or 1 method	---	---	---	---
	Any Class I, Div. 1 or 2method	---	---	---	---

UL Hazardous Locations

Class II, Division 1 & 2 Protection Methods

		Applicable Certification Documents	
Area	**Protection**	**U.S.**	**Canada**
Division 1	Dust-ignition proof	UL 1203	CSA-25 or CSA-E-1241-1-1
	Intrinsically safe	UL 913	CSA-157
	Pressurized	NFPA 496	NFPA 496
Division 2	Dust-tight	UL 1604	CSA-157 or CSA-E-1241-1-1
	Non-incendive	UL 1604	---
	Non-sparking	UL 1604	---
	Pressurized	NFPA 496	NFPA 496
	Any Class II, Div. 1 method	---	---

Hazardous Locations Markings

Class I, II & III, Division 1 & 2 (U.S. & Canada)

This marking would include:
Class(es), Division(s), Gas/Dust Group(s), Temperature Code.
Example: Class I, Division 1, Groups C & D, T4A.

Class I, Zone 0, 1 & 2 (U.S. & Canada)

This marking would include:
Method A: For Zone Listings based on UL 2279 or the CSA-E79 Series Class, Zone(s), Ex, Protection Method(s), Gas Group, Temporary Code.
Example: Class I, Zone 1, Ex de IIB T4.

Method B: For Zone Listings based on UL or CSA Division Certification Documents Class, Zone(s), Gas Group, Temperature Code.
Example: Class I, Zone 1, Group IIB T4.

Note: For U.S. Zone Listings based on UL 2279, Article 505 of the 1999 NEC requires that the "Ex" element of the marking string shall read "AEx."

Note: For Canadian Zone Listings based on the CSA-E79 Series, the "Class" and "Zone" elements of the marking string are optional.

Zone 0, 1 & 2 (IEC only)

This marking would include: Ex, Protection Method(s), Gas Group, Temperature Code.
Example: Ex de IIB T4.

Zone 0, 1 & 2 (Europe only)

This marking would include: EEX, Protection Method(s), Gas Group, Temperature Code.
Example: EEX de IIB T4.

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UL Hazardous Locations

Class III, Division 1 & 2 Protection Methods

		Applicable Certification Documents	
Area	**Protection**	**U.S.**	**Canada**
Division 1	Dust-tight	UL 1604	CSA-157
	Intrinsically safe	UL 913	CSA-157
Division 2	Dust-tight	UL 1604 Q	CSA-157
	Intrinsically safe	UL 913	CSA-157

UL's Hazardous Locations Standards

ANSI/UL 674	Electric motors and generators for use in Division 1 hazardous (classified) locations.
ANSI/UL 698	Industrial control equipment for use in hazardous (classified) locations.
ANSI/UL 781	Portable electric lighting units for use in hazardous (classified) locations.
ANSI/UL 783	Electric flashlights and lanterns for use in hazardous (classified) locations.
ANSI/UL 823	Electric heaters for use in hazardous (classified) locations.
ANSI/UL 844	Electric lighting fixtures for use in hazardous (classified) locations.
ANSI/UL 877	Circuit breakers and circuit-breaker enclosures for use in hazardous (classified) locations.
ANSI/UL 886	Outlet boxes and fittings for use in hazardous (classified) locations.
ANSI/UL 894	Switches for use in hazardous (classified) locations.
ANSI/UL 913	Intrinsically safe apparatus and associated apparatus for use in Class I, II and III, Division I, hazardous (classified) locations.
ANSI/UL 1002	Electrically operated valves for use in hazardous (classified) locations.
ANSI/UL 1010	Receptacle-plug combinations for use in hazardous (classified) locations.
ANSI/UL 1067	Electrically conductive equipment and materials for use in flammable anesthetizing locations.
ANSI/UL 1203	Explosion-proof and dust-ignition-proof electrical equipment for use in hazardous (classified) locations.
ANSI/UL 1207	Sewage pumps for use in hazardous (classified) locations.
UL 1604	Electrical equipment for use in Class I and II, Division 2, and Class III hazardous (classified) locations.
UL 2208	Solvent distillation units.
UL 2225	Metal-clad cables and cable-sealing fittings for use in hazardous (classified) locations.
ANSI/UL 2279	Electrical equipment for use in Class I, Zone 0, 1 and 2 hazardous (classified) locations.

NAMUR

The manufacturers involved in the ISO5211 committees began working on this standard in 1975, and it is only now nearing completion. Another popular standard for valve and actuator interfacing is called NAMUR (pronounced na-moor). This standard was developed at the end-user level.

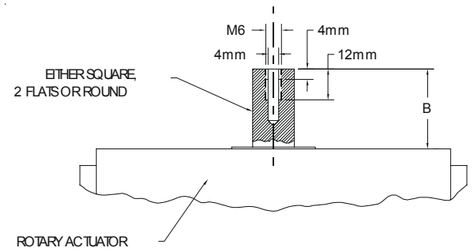
The chemical manufacturers in what was West Germany at the time, became impatient waiting for ISO and/or DIN (German Institute for Standardization) to adopt standards, so they formed their own work group called NAMUR. This is a German acronym that stands for "Normen Arbeitsgen Mess Und Regeltechnik" which loosely translates to "Standards Work Group for Instrumentation and Controls." NAMUR is not a standards organization; it is a group of chemical engineers from some of Germany's largest end users. NAMUR developed recommendations for interfaces between valves, actuators, and auxiliary equipment and published them in 1985. With a foothold in Germany, the NAMUR recommendations quickly spread to other countries. By 1990 most actuator manufacturers had a NAMUR version of their product available.

VDI/VDE3845

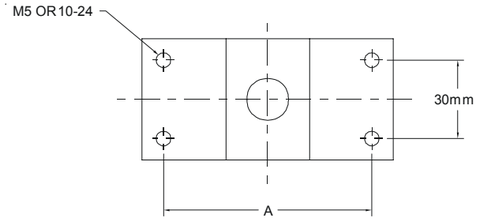
The NAMUR recommendations gained such acceptance that they were used as the main part of VDI/VDE, a German standard published in 1991 by the Society of German Engineers (VDI) and The Association of German Electrotechnicians (VDE).

VDI/DE3845 (loosely referred to as NAMUR) incorporates standards already defined in ISO5211/1&2 and DIN3337 (the DIN variation of ISO5211/3). However, it also breaks new ground by standardizing on mounting dimensions between rotary actuators and accessories such as positioners, signal transmitters (such as limit switches), and solenoid valves. This standard specifies a minimum bracket height of 45 mm (approx 2") and a maximum height of 75 mm (approx 3"). If the standard were any smaller it would make finger access to the bolts difficult, and a taller standard could present a problem when installation space is limited.

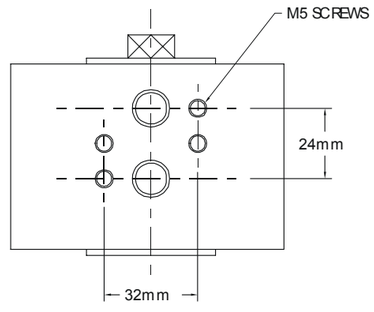
DIMENSIONS IN mm				
A	80	80	130	130
B	20	30	30	50



NAMUR Shaft



NAMUR Topworks Mounting



NAMUR Pilot Valve Ports

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Acyclic Communication
A type of communication used between field devices and a host system. It is used for information that is not involved in loop execution.

Ambient Temperature
The temperature for a medium, such as gas or liquid, surrounding an object.

Analog Output
An electrical output from a sensor that changes proportionately with any change in input pressure.

Analog Signal
A signal in which the data is represented or transmitted in continuously varying quantities, as opposed to a digital signal.

ANSI
Abbreviation for American National Standards Institute.

AWG
Abbreviation for American Wire Gauge; based on circular mil system.

AWM
Appliance Wiring Material.

Axial Motion
A motion of the target along the reference axis.

BASEEFA
Abbreviation for British Approvals Service for Electrical Equipment in Flammable Atmospheres.

Baud
The number of bits that can be sent or received per second. Technically, baud is the number of times per second that the carrier signal shifts value. For example, a 1200 bit-per-second modem actually runs at 300 baud, but it moves 4 bits per baud (4 x 300 = 1200 bits per second).

bps
Bits-Per-Second. A measurement of how fast data is moved from one place to another. A 56K modem can move about 57,000 bits per second.

CEE
Abbreviation for the International Commission on Rules for the Approval of Electrical Equipment.

CE Mark
A trademark that allows a manufacturer trade privileges with the European Union. The CE Mark, by responsibility of the manufacturer, insures that certain directives have been met through testing and documentation.

CENELEC
European Committee for Electrotechnical Standardization.

C-UL
Products bearing this mark are a UL listed device and are tested to CSA standards.

Communications Protocol
Hardware and software standards that govern transmission between two computers or communications devices. There are several layers, or levels, of functionality in a protocol. Each layer may be available as a separate software component or several layers may be combined into one. Learning the seven-layer protocol hierarchy, known as the "OSI model," is essential for understanding protocols.

Communications Stack
The communications stack consists of a number of different functional layers. These layers are grouped by functionality and differ among specific protocols. The layers generally refer to the OSI seven-layer model. For example, FOUNDATION Fieldbus contains the following groups: the Physical layer, the Link and Application Layer, and the User Layer.

Contact Bounce
A condition that can occur with switching circuits in which the movable contacts close against the stationary contacts with enough energy to "bounce" and reopen the contacts. This may occur several times, very rapidly, during a contact closure.

Contact Pressure
The amount of force holding the movable and stationary contacts together.

CSA
Abbreviation for Canadian Standards Association.

Cyclic Communication
A type of communication used to communicate function blocks data between different function blocks in different devices.

DEMCO
A subsidiary of Underwriter's Laboratories.

Device Description (DD)
Provides an automatic way for host systems to see and use field devices. The device description is a representation of the device's functionality. Each device has a specific device description, which describes its resource and transducer blocks capability. The device description is available either from the vendor or from the Fieldbus FOUNDATION. This device description is loaded into a host in much the same way a printer driver is loaded into a personal computer. The host now has all of the capabilities necessary to fully use all of the functionality of the field device.

Device Description Language
A programming language specifically designed to develop field device descriptions. Device description language is a technology that is available only to FOUNDATION™ Fieldbus or to HART. It is a programming language similar to C language.

Differential
The distance which the actuator must move from the sensing point in order to allow the switch to reset. Also known as Hysteresis or Reset.

Differential Travel
A distance between the operating and release points.

Digital Output
Output that exists in only two stable states, appearing in the manner of a switch; that is, it is either "On" or "Off" or "High" or "Low" (i.e., high voltage or low voltage).

Digital Signal
A signal in which the data is transmitted or represented by a series of discrete pulses or steps of constant amplitude.

Dry Circuit
A circuit in which the open circuit voltage is 0.03V or less and the current is 200mA or less. At such low levels, the current is not able to break through the film of oxides, sulfides or other films which may build up on the contact surfaces.

Environmental Seal
A seal created by gaskets, seals, potting or other means, designed to keep out contamination which might reduce performance. An environmental seal is sometimes referred to as a "factory seal."

Explosion Proof
The property of being able to contain an explosion within the sensor or housing.

Fieldbus
An industrial control network for interconnecting sensors, actuators, and controllers. The fieldbus protocol stack includes a physical layer, data link layer, and application layer.

Fieldbus Foundation
A not-for-profit corporation that consists of many of the world's leading suppliers and end users of process control and manufacturing automation products.

Frequency
The number of cycles completed by an alternating current in one second. The newest term Hertz, abbreviated "Hz," is equivalent to "cycles per second."

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Function Block
A process control or I/O function block that is used to implement the process control strategy. The function block interfaces with the transducer block to access process control information. The function block communicates with the FOUNDATION Fieldbus highway to make this information available to other devices. Examples: Analog Input (AI), Analog Output (AO), Proportional/Integral/Derivative (PID) control.

Gateway
A hardware or software setup that translates between two dissimilar protocols.

H1 Field Device
A fieldbus device connected directly to an H1 fieldbus. Typical H1 Field Devices are valves and transmitters.

Hermetic Seal
A permanent seal created by fusion, soldering, welding, brazing or other means, to prevent the transmission of gases. A hermetic seal is also referred to as "helium tight," "leak tight," or "vacuum tight." For most applications, a hermetic seal is one where the leakage rate is less than 1×10^{-8} cubic centimeters per second of helium, at a differential of one atmosphere.

Hi-Pot
A device used to place a high voltage across an insulator, to test its insulating properties. The typical Hi-Potential Breakdown Test specified by CSA and UL requires that the voltage be twice the rated voltage, plus 1000V, plus 20% of that total. For example, a 600V switch would be tested at [(600 x 2) + 1000] x 1.2=2640V. This voltage is placed across the insulator for 1 second. If the insulator doesn't break down, it is considered acceptable.

High Speed Ethernet (HSE)
High Speed Ethernet (HSE) is the Fieldbus FOUNDATION's backbone network that runs at 100 Mbit/second.

HSE Field Device
A fieldbus device connected directly to a High Speed Ethernet (HSE) fieldbus. Typical HSE Field Devices are HSE Linking Devices, HSE Field Devices running Function Blocks (FBs), and Host Computers.

HSE Linking Device
A device used to interconnect H1 fieldbus Segments to High Speed Ethernet (HSE) to create a larger network.

HSE Switch
Standard Ethernet equipment used to interconnect multiple High Speed Ethernet (HSE) devices such as HSE Linking Devices and HSE Field Devices to form a larger HSE network.

Hub
Generally, a term used to describe a device that serves as the center of a star-topology network. Hardware or software device that contains multiple independent but connected modules of network and internetwork equipment. Hubs can be active (where they repeat signals sent through them) or passive (where they do not repeat, but merely split, signals sent through them).

Hysteresis
The distance which the actuator must move from the sensing point in order to allow the switch to reset. Also known as Differential or Reset.

IEC
Abbreviation for the International Electrical and Electronics Engineers.

Interchangeability
The capability to substitute a device from one manufacturer with that of another manufacturer on a fieldbus network without loss of functionality or degree of integration.

Interoperability
The capability for a device from one manufacturer to interact with that of another manufacturer on a fieldbus network without loss of functionality.

Intranet
Any network that provides similar services within an organization to those provided by the Internet outside it but that is not necessarily connected to the Internet. The commonest example is the use by a company of one or more World-Wide Web servers on an internal TCP/IP network for distribution of information within the company.

Intrinsically Safe (IS)
Intrinsic safety may be attained through integral circuitry or an appropriately sized barrier, both of which are current limiting devices. The on-board circuitry, or barrier, is designed for the area classification which the monitoring device is to be used. The basis of intrinsic safety is to limit the amount of current through a device, so that if there is exposure to the surrounding atmosphere, there is not sufficient heat generated to ignite that atmosphere.

ISO
Abbreviation for the International Standards Organization.

kbps
Kilobits per second. A bit rate expressed in thousands of bits per second.

LAN
Local Area Network. A computer network limited to the immediate area, usually the same building or floor of a building.

Latching Condition
A condition where the switch will not reset to its unoperated mode. It must be operated, then reset, in two separate operations.

Lateral Motion
A motion of the target perpendicular to the reference axis.

Leakage Current
Minute amounts of current which flow through a switch even in the unoperated state. Leakage current occurs with electronic switches since they require an external power supply. GO® Switches do not require a power supply and, therefore have no leakage current.

Link Active Scheduler (LAS)
Maintains time critical device-to-device control communications on a segment. A LAS is a deterministic, centralized bus scheduler that maintains a list of transmission times for all data buffers in all devices that need to be cyclically transmitted. Only one Link Master (LM) device on an H1 fieldbus Link can be functioning as that link's LAS.

Macro Cycle
The coordination of function block execution and segment communications in a Foundation Fieldbus link. This coordination ensures that the control action is repeatable and deterministic.

Master Devices
Devices that determine the data communication on the bus. A master can send messages without an external request when it holds the bus access rights (the token).

Master-Slave Communications
Communications in which one side, called the "master," initiates and controls the session. The "slave" is the other side and responds to the master's commands.

MBps
Megabits per second. A bit rate expressed in millions of binary bytes per second.

MSHA
Abbreviation for Mine Safety Heath Administration.

NEC
National Electric Code.

NEMA
Abbreviation for the National Electrical Manufacturers Association.

Node
An addressable device attached to a network. More often called a "host."

Non-Incendive
Non-incendive equipment contain components that do not allow arcs or sparks to ignite concentrations of flammable gases. One method of producing a non-incendive switch is by sealing off the contact chamber with a hermetic seal so that a flammable gas cannot enter into the arcing/sparking area of the switch.

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Normally Closed Circuit
Circuit which passes current when the GO Switch is not actuated. Symbolized by N/C.

Normally Open Circuit
Circuit which passes current when the GO Switch is actuated. Symbolized by N/O.

Operating Distance
A distance at which the target under its axial or lateral approaching causes the switch to operate. An axial operating distance is a distance between an operating point and the sensing face; a lateral operating distance is a distance between an operating point and the reference axis.

OSI
Open System Interconnection. An ISO standard for worldwide communications that defines a framework for implementing protocols in seven layers. Control is passed from one layer to the next, starting at the application layer in one station, proceeding to the bottom layer, over the channel to the next station, and back up the hierarchy.

OSI Reference Model
Network architectural model developed by ISO and ITU-T. The model consists of seven layers, each of which specifies particular network functions, such as addressing, flow control, error control, encapsulation, and reliable message transfer. The lowest layer (the physical layer) is closest to the media technology. The lower two layers are implemented in hardware and software whereas the upper five layers are implemented only in software. The highest layer (the application layer) is closest to the user. The OSI reference model is used universally as a method for teaching and understanding network functionality.

Physical Layer
The first functional layer in the communications stack. The physical layer is concerned with the physical characteristics of the signal of the wire.

Protocol
A set of formal rules describing how to transmit data, especially across a network. Low level protocols define the electrical and physical standards to be observed, bit- and byte-ordering, and the transmission and error detection and correction of the bit stream. High level protocols deal with the data formatting, including the syntax of messages, the terminal to computer dialogue, character sets, and the sequencing of messages.

Proximity Switch
A position switch which is operated without mechanical contact with a moving target.

PSI
Pounds per square inch. A unit of measure for pressure on a given surface.

Pulses Per Minute (PPM)
Refers to applications, particularly in motion control circuits on rotary applications, where several operations of a switch take place with each revolution of the actuator device. If the actuator turns at "X" revolutions per minute and there are "Y" operations per revolution, the pulses per minute rate would be "X" x "Y" PPM.

PVC
Polyvinyl chloride.

Rated Temperature
Maximum temperature at which an electric component can operate for extended periods without breaking down due to heat.

Rated Voltage
Maximum voltage at which an electric component can operate for extended periods without undue degradation or safety hazard.

Reference Axis
An axis perpendicular to the sensing face and passing through its center.

Release Point
A position of the target at its axial or lateral moving away from the switch when it returns to nonoperating state.

Repeatability
Ability to perform the same task operating parameters, consistently, time after time.

Repeater
An active, bus-powered or non-bus-powered device used to extend the range over which signals can be correctly transmitted and received for a given medium. The maximum number of Repeaters allowed varies based on the network protocol in use.

Reset
The distance which the actuator must move from the sensing point in order to allow the switch to reset. Also known as Differential or Hysteresis.

Resource Block
The resource block fully defines the device to the outside world. With the resource block, a host knows the attributes and functionality of the device. The resource block contains information which is common to the whole resource, including device identification, hardware, device features, memory and CPU availability, write protection, management of fail-safe, and alarms.

Response Time
The amount of time required for the switch to move from N/C position to N/O position, or vice versa.

Router
Network layer device that uses one or more metrics to determine the optimal path along which network traffic should be forwarded. Routers forward packets from one network to another based on network layer information. Occasionally called a gateway (although this definition of gateway is becoming increasingly outdated).

RTV
Abbreviation for Room Temperature Vulcanizing.

SAA
Abbreviation for Standards Association of Australia.

SAE
Abbreviation for Society of Automotive Engineers.

Same Polarity Only
On DMDB switches the like terminals must be wired with the same voltage polarity.

Segment
A section of an H1 fieldbus that is terminated in its characteristic impedance. Segments can be linked by Repeaters to form a longer H1 fieldbus. Each segment can include up to 32 H1 devices.

Sensing Area
That location marked on a GO Switch that is most sensitive to a ferrous or magnetic target.

Sensing Distance Range
Maximum gap between switch and actuator when the switch first operates; the trip point.

Sensing Face
A surface of the switch through which the magnetic field interact with a moving target and causes the switch operate.

Slave Devices
Peripherals such as I/O devices, valves, drives and measuring transducers, that do not have bus access rights and can only acknowledge received messages or send messages to the master when requested to do so. Slaves are called passive stations. Since they only require a small portion of the bus protocol, their implementation is particularly economical.

SO Cable
Designed for use with industrial equipment.

Standard Target
A specified object used for making comparative measurements of the operating and differential distances.

Switch
A network device that filters, forwards, and floods frames based on the destination address of each frame. The switch operates at the data link layer of the OSI model.

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Temperature Rating
Maximum and minimum temperature at which an insulating material can be used in continuous operation without loss of basic properties.

Terminator
An impedance-matching module used at or near each end of a transmission line.

TEW
Thermoplastic Equipment Wire.

Transducer
A fully packaged, signal conditioned, compensated, and calibrated sensor.

Transducer Block
Fully defines the information about the device sensor or actuator. It is the link between the physical world and the information world. The transducer block communicates with the analog input (AI) or analog output (AO) function block. The AI and AO blocks communicate with the outside world. This block is responsible for information and functionality specific to for example the measurement of a particular physical property, such as pressure or temperature, or a specific measurement technology, such as ultrasonic or Coriolis.

Transmitter
A transducer with a current loop or digital output enabling transmission of a signal over a longer distance.

Trunk
The main communication highway between devices on an H1 fieldbus network. The Trunk acts as a source of main supply to Spurs on the network.

UL
Abbreviation for Underwriter's Laboratories.

User Link & Application Layer
Term to describe some of the layers in a FOUNDATION Fieldbus communication stack.

User Layer
The upper layer in a FOUNDATION Fieldbus communications stack. The user layer has three major components: function blocks, transducer blocks, and resource blocks. The User Layer provides Function Blocks, as well as Device Descriptions, which allow the host system to communicate with the devices without the need of custom programming.

VCR
Virtual Communication Relationship. Configured application layer channels that provide for the transfer of data between applications. FOUNDATION Fieldbus describes three types of VCRs: Publisher/Subscriber, Client/Server, and Source/Sink.

Virtual Field Device (VFD)
Used to remotely view local device data described in the object dictionary. A typical device will have at least two VFDs.

Voltage Drop
The amount of voltage across a pair of closed contacts. In GO Switches, this voltage drop is extremely low, compared to solid state switches.

Voltage Rating
The highest voltage that may be continuously applied to an electrical device in conformance with standards or specifications.

WAN
Wide Area Network. Any internet or network that covers an area larger than a single building or campus.

Conversion Factors

PSI x 27.71 = in. H_2O
PSI x 2.036 = in. Hg
PSI x 703.1 = mm H_2O
PSI x 51.75 = mm Hg
PSI x .0703 = kg/cm^2
PSI x .0689 = bar
PSI x 68.95 = mbar
PSI x 6895 = Pa
PSI x 6.895 = kPa

Note: Conversion factors are rounded.

Pressure*			
BAR	ATM.	Kg cm2	PSI
1	1	1	15
2	2	2	30
3	3	3	45
5	5	5	75
10	10	10	150
20	20	20	300
30	30	30	450
50	50	50	750
100	100	100	1500
200	200	200	3000
300	300	300	4500
500	500	500	7500
1000	1000	1000	15000

*** Pressure**
Standard Atmosphere Pressure is 15 PSI (14.7)
15 PSI = 1 Atmosphere

Bar is a unit of pressure equal to 1 Atmosphere or approx. 15 PSI

*Conversions are approximate for the convenience of users.

Fraction/Decimal/Millimeter Conversion Chart					
Inches	Decimals	Millimeters	inches	Decimals	Millimeters
1/64	0.0157	0.40	33/64	0.5156	13.10
1/32	0.0313	0.80	17/32	0.5312	13.49
3/64	0.0469	1.19	35/64	0.5469	13.89
1/16	0.0625	1.59	9/16	0.5625	14.29
5/64	0.0781	1.98	37/64	0.5781	14.68
3/32	0.0938	2.38	19/32	0.5938	15.08
7/64	0.1094	2.78	39/64	0.6094	15.48
1/8	0.125	3.18	5/8	0.6250	15.88
9/64	0.1406	3.57	41/64	0.6406	16.27
5/32	0.1563	3.97	21/32	0.6563	16.67
11/64	0.1719	4.37	43/64	0.6719	17.07
3/16	0.1875	4.76	11/16	0.6875	17.46
13/64	0.2031	5.52	45/64	0.7031	17.86
7/32	0.2188	5.56	23/32	0.7188	18.26
15/64	0.2344	5.95	47/64	0.7344	18.65
1/4	0.2500	6.35	3/4	0.7500	19.05
17/64	0.2656	6.75	49/64	0.7656	19.45
9/32	0.2813	7.14	25/32	0.7813	19.84
19/64	0.2969	7.54	51/64	0.7969	20.24
5/16	0.3125	7.94	13/16	0.8125	20.64
21/64	0.3281	8.33	53/64	0.8281	21.03
11/32	0.3438	8.73	27/32	0.8348	21.43
23/64	0.3594	9.13	55/64	0.8594	21.83
3/8	0.3750	9.53	7/8	0.8750	22.23
25/64	0.3906	9.92	57/64	0.8906	22.62
13/32	0.4063	10.32	29/32	0.9063	23.02
27/64	0.4219	10.72	59/64	0.9219	23.42
7/16	0.4375	11.11	15/16	0.9375	23.81
29/64	0.4531	11.51	61/64	0.9531	24.21
15/32	0.4688	11.91	31/32	0.9688	24.61
31/64	0.4844	12.30	63/64	0.9844	25.00
1/2	0.5000	12.70	1	1	25.40

1 mm = .040" .001" = .0254 mm

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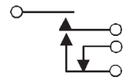
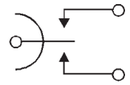
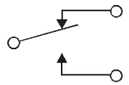
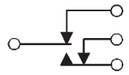
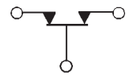
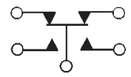
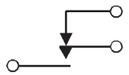
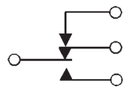
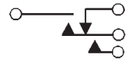
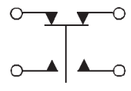
Temperature Conversion	
Fahrenheit (F)	Centigrade (C)
-40	-40.00
-30	-34.44
-20	-28.89
-10	-23.33
0	-17.78
10	-12.22
20	-6.67
30	-1.11
40	4.44
50	10.00
60	15.56
70	21.11
80	26.67
90	32.22
100	37.78
110	43.33
120	48.89
130	54.44
140	60.00
150	65.56
160	71.11
170	76.67
180	82.22
190	87.78
200	93.33
250	121.11
275	135.00
300	148.89
325	162.78
350	176.67
375	190.55
400	204.44
425	218.33
450	232.22
475	246.11
500	260.00

Temperature conversion formulas

$C = \frac{5}{9}(F - 32)$ $F = \frac{9}{5}(C + 32)$

Basic Contact Forms

A **Make SPST-NO** 	**J** Make, Make, Break 
B Break SPST-NC 	**K** Center off SPDT 
C **Break, Make Transfer SPDT** 	**L** Break, Make, Make 
D Make, Break (Continuity Transfer) 	**U** Double make Contact on arm 
E Break, Make, Break 	**V** Double break Contact on arm 
F Make, Make 	**W** Double break, Double make, Contact on arm 
G Break, Make 	**X** Double make 
H Break, Break, Make 	**Y** Double break 
I Make, Break, Make 	**Z** **Double make Double break SPDT-DB** 

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Notes