FLOWSERVE

Worcester Controls
Rotary Switches
High Performance, Reliability and User Friendly

Experience In Motion

Flowserve Flow Control Worcester Switches

Flowserve Corporation's Worcester Valve Automation Systems provides complete valve and damper automation to the worldwide processing industries. We provide maximum value to the end user through a broad offering of products, services, application engineering and our systematic approach to automation.


Quality, Dependability and Productivity

Recognized as the leaders in position indication and positioning control, Worcester limit switch and positioner products provide unparalleled performance combined with ease of calibration and maintenance.

Worcester rotary position indicators and positioners have a proven track record in industries such as chemical and petrochemical processing, oil and gas, pulp and paper, pharmaceutical, and energy-related industries. Hazardous location approvals and corrosion resistant materials make the Worcester rotary position indicators and positioners ideal for even the most hostile environments.

Our ISO 9001 certified manufacturing facilities, R&D department and engineering headquarters are located in Springville, Utah, and Cookeville, Tennessee.

Sales and service facilities are strategically located in industrial centers throughout the world.
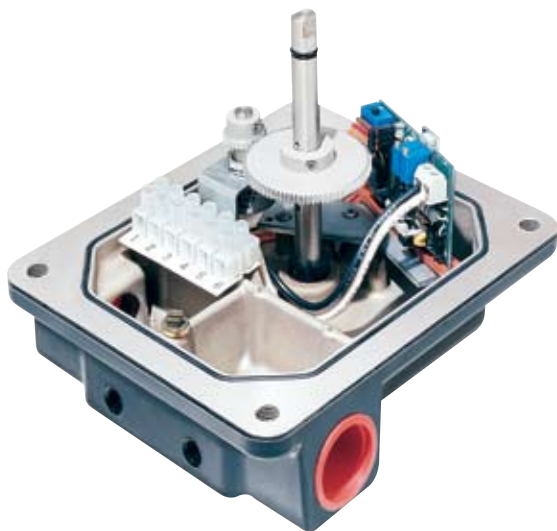
Featured Products

Page 4, 5

UltraSwitch™ WGL/WXCL/WPL Series Rotary Position Indicators
The UltraSwitch series of position indicators provides a compact and economical package for both visual and remote electrical indication of valve position. Models are available in both die cast aluminum and engineered resin versions with UL and C-UL ratings suitable for NEMA 4, 4x and NEMA 4, 4x, 7 & 9 applications.

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Aviator™/BUSwitch™ Integrated Valve Controller
The Aviator Integrated Valve Controller with internal pilot solenoid coil provides a truly integrated package for both visual and electrical position indication as well as control of supply air to rotary actuators. The Worcester BUSwitch provides all of the features of the Aviator but enables control and monitoring of automated on-off valves through digital fieldbus technology. Available in both aluminum and non-metallic enclosures, the Aviator/BUSwitch is suitable for NEMA 4, 4x and NEMA 4, 4x, 7 & 9 applications.
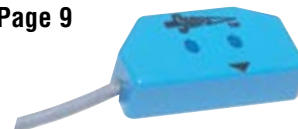
Internal Switch Options
Page 9

An extensive range of both mechanical and proximity limit switches makes the UltraSwitch and Aviator the perfect choices for a wide range of applications.
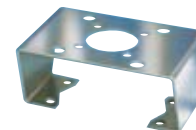
AutoBrakits
Page 9

Stainless steel NAMUR mounting kits provide consistent and reliable direct coupling to NAMUR compliant actuators.

3

WGL Series UltraSwitch™ Position Indicators

The WGL Series rotary limit switch enclosure provides a compact, economical package for visual and remote electrical indication of valve position. The die cast aluminum housing is electrostatic powder coated and designed to meet NEMA 4x standards. The housing can also be configured for sanitary applications.

Features:
- **Pharos** visual indicator for high contrast, wide-angle viewing.
- **NAMUR** mounting compliance eliminates coupler and maximizes interchangeability.
- **Captive** stainless steel cover screws.
- **Sanitary** options include captive stainless steel hex head cover screws.

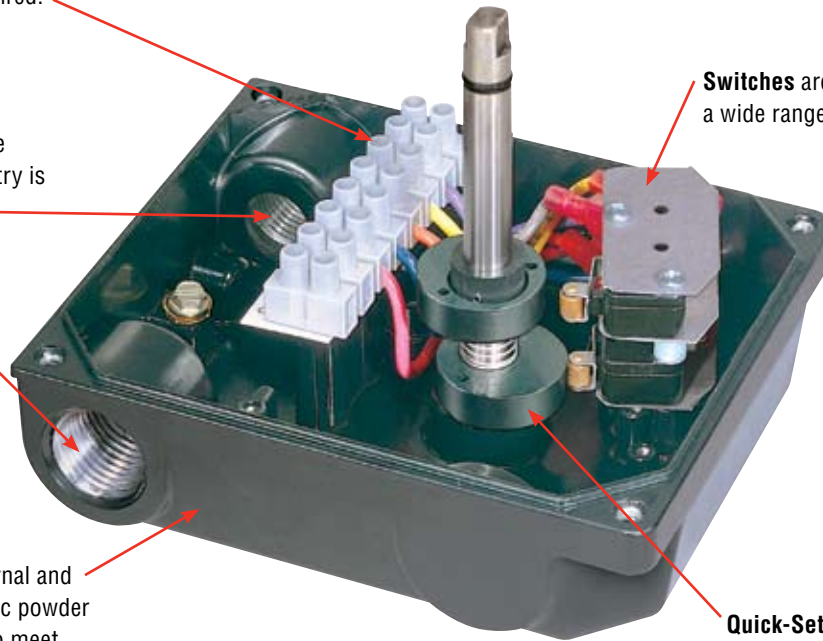Standard housing offers a no "nooks and crannies" design to facilitate washdown.

Terminal Strip is multipoint and prewired.

Dual ½" conduit entries are standard; optional third entry is available

Housing is die cast aluminum with internal and external electrostatic powder coating, designed to meet NEMA 4x standards.

Switches are available in a wide range of options.

Quick-Set™ spring loaded cams are extra wide and splined to allow tool free limit switch calibration.

How To Order (Select **Bold Type Code** from each column that applies)

Brand	Optional Prefix	Model	Cover	Switch*	Solenoid Options	Options	Extra Terminal Locations
W - Worcester Controls	**Blank** - Double D Shaft (¼" Flats) **N** - NAMUR Shaft **E** - Epoxy Coated **B** - Epoxy Coating/ NAMUR shaft **H** - Hex Head Cover Screws **D** - Hex Head Cover Screws/NAMUR Shaft	**GL**	**1** - Flat Top **2** - Pharos Indicator **C** - Pharos 90° 3-way **D** - Pharos 180° 3-way **E** - Pharos 180° 3-way Center Blocked **T** - Flat Indicator	**0** - No Switches (Empty Housing) **1** - (2) SPDT Mechanical **4** - (2) SPST Proximity **5** - (2) SPDT Proximity **8** - (2) P&F NJ2-V3-N (NAMUR) **E** - (2) SPDT Sabre Proximity **G** - (2) SPDT Mechanical Gold Contacts **P** - (2) Phazer II SPDT Proximity **T** - (2) Phazer II BRS SPST Proximity **Z** - AS-i Communications Card	**0** - No Solenoid	**Blank** - No Option **T** - Third Conduit Entry **H** - Heavy-Duty Terminal Block	**Blank** - 2 Open Terminal Locations (Standard) **4** - 4 Open Terminal Locations (2 SPST Switches) **6** - 6 Open Terminal Locations (2 SPDT Switches) **8** - 8 Open Terminal Locations (2 SPST Switches)

Note: Example: WGL210, WNGL130T
For Replacement Pharos Kit part numbers, see UltraSwitch Nomenclature
* Consult factory for additional switch options

WPL-Series UltraSwitch™ Position Indicators

The WPL-Series UltraSwitch is provided with an engineered resin enclosure making it ideal for harsh corrosive environments. It is certified to UL/CSA/ATEX standards for nonincendive Class 1, Div. 2 hazardous locations. Designed to meet NEMA 4, 4x standards, the housing features a unique labyrinth cover seal.

Features:

- **UltraDome™** visual indicator provides high contrast, wide-angle viewing of valve position. Also available with snap-on Pharos indicator or a low-profile flat indicator.

- **Quick-Set™** spring loaded cams are extra wide and splined to allow tool free limit switch calibration.

- **Switches** available in a wide range of options.

- **Terminal Strip** is multipoint and prewired.

- **Housing** is an engineered resin suitable for corrosive environments.

- **Dual** ¾" conduit entries are standard.

- **NAMUR** mounting compliance eliminates coupling and maximizes interchangeability.

- **Captive** stainless steel cover screws.

- **Internal Potting Wells** within housing at the conduit entries available for factory sealed leads. They may be filled with conduit potting compound or RTV silicone sealant to prevent the ingress of corrosive vapors or liquids.

## How To Order *(Select Bold Type Code from each column that applies)*

Brand	Optional Prefix	Model	Cover	Switch*	Analog Output	Solenoid Options	Options	Extra Terminal Locations
W - Worcester Controls	**Blank** - Double D Shaft (¼" Flats) **N** - NAMUR Shaft **H** - Hex Head Cover Screws **D** - Hex Head Cover Screws/ NAMUR Shaft	**PL-** Zytel® Engineered Resin Housing, NEMA 4, 4x	**1** - Flat Cover **2** - Pharos Indicator **C** - Pharos 90° 3-way **D** - Pharos 180° 3-way **E** - Pharos 180° 3-way Center Blocked **T** - Flat Indicator **U** - UltraDome Indicator	**0** - No Switches (Empty Housing) **1** - (2) SPDT Mechanical **2** - (4) SPDT Mechanical **A** - (2) SPDT Mechanical with 3-Position Control **G** - (2) SPDT Mechanical, Gold Contacts **3** - (2) DPDT Mechanical **4** - (2) SPST Proximity **5** - (2) SPDT Proximity **6** - (4) SPST Proximity **E** - (2) Sabre SPDT Proximity **F** - (4) Sabre SPDT Proximity **P** - (2) Phazer II SPDT Proximity **H** - (4) Phazer II SPDT Proximity **T** - (2) Phazer II BRS SPDT Proximity **W** - (4) Phazer II BRS SPDT Proximity **8** - (2) P&F NJ2-V3-N (NAMUR) **U** - (2) GO Proximity, 35-13319-A1A **Z** - AS-i Communications Card	**0** - None **T** - 4-20 mA Transmitter **D** - 180° Travel 4-20 mA Transmitter **E** - 45°/60° Travel 4-20 mA Transmitter **A** - 0-1k Ohm Potentiometer **B** - 0-5k Ohm Potentiometer **C** - 0-10k Ohm Potentiometer	**0** - None	**0** - No Option **H** - Heavy-Duty Terminal Block **P** - Seal/Potted Leads	**Blank** - 2 Open Terminal Locations (Standard) **4** - 4 Open Terminal Locations (2 SPST switches) **6** - 6 Open Terminal Locations (2 SPDT switches) **8** - 8 Open Terminal Locations (2 or 4 SPST switches)

Consult factory for additional switch options.
Zytel® is a registered trademark of DuPont.

WXCL-Series UltraSwitch™ Position Indicators

The WXCL-Series UltraSwitch is a globally-certified explosionproof/flameproof position indicator for use throughout the world. The rugged die cast aluminum enclosure has a dichromate undercoat and electrostatic powder topcoat for superior corrosion resistance. The housing is certified to UL/CSA/ATEX standards and is available with optional position transmitter and a wide range of switches.

Optional 4-20 mA transmitter shown
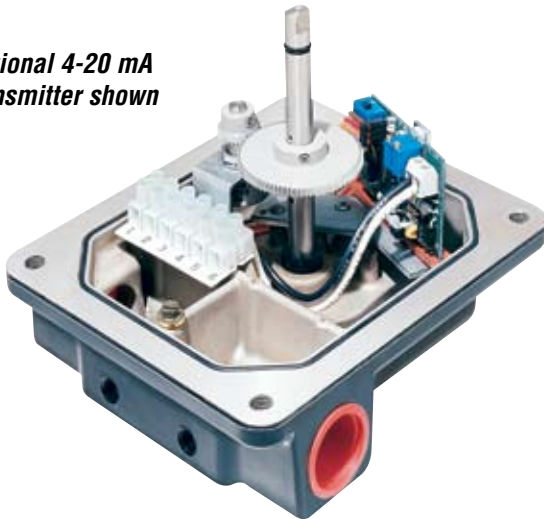
Features:

- **UltraDome™** visual indicator provides high contrast, wide-angle viewing of valve position.

- **Quick-Set™** spring loaded cams are extra wide and splined to allow tool free limit switch calibration.

- **Switches** available in a wide range of options.

- **Terminal Strip** is multipoint and prewired.

- **Housing** is die cast aluminum with dichromate undercoat and electrostatic powder topcoat, UL/CSA/ATEX approved for hazardous locations.

- **Dual** ¾" conduit entries are standard.

- **NAMUR** mounting compliance eliminates coupling and maximizes interchangeability.

- **Captive** stainless steel cover screws.

- **Potting** compartments available for factory sealed leads.

How To Order *(Select **Bold Type Code** from each column that applies)*

Brand	Shaft Option	Model	Indicator Option	No. Switches	Switch Type*
W - Worcester Controls	**D** - Double D Shaft (¼" Flats) **N** - NAMUR Shaft	**XCL** - (2) ¾" NPT Conduit **XML** - (2) M25 Conduit	**1** - Flat Top (no indicator) **U** - Red/Green (std) **C** - 90° 3-way **D** - 180° 3-way **E** - 180° 3-way Blocked Center **K** - Ektar Red/Green **H** - Black/Gray/Yellow **R** - Reverse (Red - Open, Green - Closed)	**0** - No Switches **1** - 1 Switch **2** - 2 Switches **4** - 4 Switches	**00** - No Switches **M1** - SPDT Mechanical **MG** - SPDT Mechanical - Gold Plated **M3** - DPDT Mechanical **MA** - 3-Position Control **MD** - DA 3-Position Control w/Indication **MS** - SR 3-Position Control w/Indication **P4** - SPST Proximity **P5** - SPDT Proximity **PE** - SPDT Sabre **PP** - SPDT Phazer **PT** - SPST BRS **N8** - P+F NJ2-V3-N **FZ** - AS-i Communications Card

Certifications	Analog Output Options	Wiring Options
- 14 - General Purpose **- 18** - UL/CSA/ATEX Explosionproof **- 19** - ATEX Explosionproof **- M1** - Metal Nameplate UL/CSA/ATEX Explosionproof (Mechanical Switch) **- M2** - Metal Nameplate UL/CSA/ATEX Explosionproof (Proximity Switch) **- M3** - Metal Nameplate ATEX Explosionproof	**- 0** - None (std) **- T** - 4-20 mA Transmitter **- D** - 180° 4-20 mA Transmitter **- A** - 0-1k Ohm Potentiometer **- B** - 0-5k Ohm Potentiometer **- C** - 0-10k Ohm Potentiometer	**0** - None (std) **H** - Heavy-Duty Terminal Strip

Open Terminals (Minimum)	Special Options	Coating Options
2 - 2 open (std) **4** - 4 open **6** - 6 open	**0** - None (std) **P** - 180° Potentiometer Gearing **V** - Viton O-rings	**0** - Black Polyester Powdercoat (std) **E** - White Epoxy

Example
NWXCLU2M1-18-00200 = Worcester WXCL UltraSwitch, NAMUR Shaft, UltraDome indicator, (2) SPDT Mechanical switches, FM/CSA and ATEX certifications.
*Consult factory for additional switch options.

Aviator™ Integrated Valve Controller

WXV Series

The Aviator integrated valve controller enclosure and solenoid valve provides an integrated package for position indication and control of supply air to rotary actuators. The WXV Series housing is designed for hazardous locations for NEMA 4, 4x, 7 & 9 and CENELEC EEx d IIB.

WWR Series

The WWR Series offers many features of the WXV Series in an engineered resin housing. The WWR Series housing is a non-metallic engineered resin and provides an excellent enclosure for harsh corrosive environments. The WWR Series Aviator is designed for easy upgrading to fieldbus communication protocols.

Features
- **Captive** stainless steel cover screws.
- **UltraDome** visual position indicator provides high contrast, wide-angle viewing of valve position.

- **Fieldbus Upgradeability.** The Aviator has been designed to accommodate the circuitry required to interface with various fieldbus protocols.
- **NAMUR** mounting compliance eliminates coupler and maximizes interchangeability.

Internal Pilot Solenoid Coil offers the advantage of having the solenoid coil contained and protected within the Aviator housing. This provides a high degree of protection in hazardous environments and washdown applications.

Quick-Set™ spring loaded cams are extra wide and splined to allow tool free limit switch calibration.

Switches are available in a wide range of options.
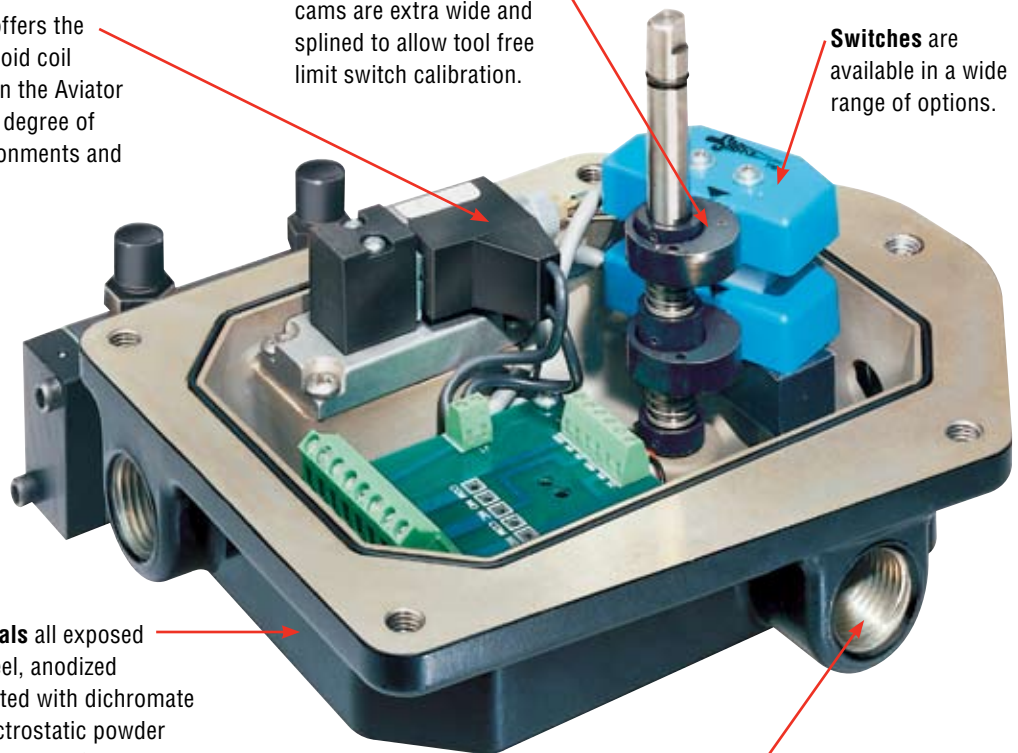
Corrosion Resistant Materials all exposed parts are either stainless steel, anodized aluminum, or aluminum treated with dichromate undercoat and polyester electrostatic powder top coat. The WWR Series provides further protection with an engineered resin enclosure.

Three ½" conduit entries are standard (WXV Series).

BUSwitch™ Integrated Valve Controller

The BUSwitch™ integrated valve controller provides all of the features of the Aviator but enables control and monitoring of automated on-off valves through fieldbus technology. The BUSwitch communication cards provide a gateway to fieldbus networks allowing seamless integration of the limit switches and solenoid valves. The integral BUSwitch functions assist the user with predictive and preventative maintenance. The intelligent valve automation package features AS-i, FOUNDATION Fieldbus, DeviceNet, and PROFIBUS DP protocols. The BUSwitch is available in both explosionproof aluminum or corrosion resistant engineered resin housings.

Protocol-Specific Features:

• **FOUNDATION Fieldbus** BUSwitch controls include cycle counter and timer functions. User-selectable failure modes permit valves to move to desired position on loss of communications.

Dry-contact external input enables integration of emission-detecting pressure switch or other simple device.

• **PROFIBUS DP** BUSwitch features cycle counter, timer and alarm functions. User-selectable failure modes permit valves to move to desired position on loss of communications. Dry-contact external input enables integration of emission-detecting pressure switch or other simple device.

• **DeviceNet** BUSwitch offers basic on-off valve control with limited diagnostic capabilities. Solenoid coil continuity, stroke timer, and stroke counter provide important information for effective valve and actuator maintenance. A dry-contact external input enables integration of emission-detecting pressure switch or other simple device.

• **AS-i** BUSwitch provides simple on-off valve control in a very economical package. It is available in all limit switch enclosures, including the WGL, WPL and WXCL UltraSwitches.
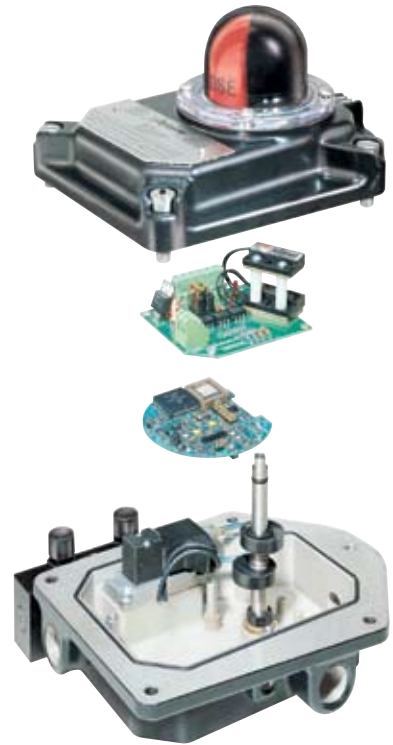
How To Order (Select **Bold Type Code** from each column that applies)

Brand	Model	Indicator	Switch	Number of Coils	Solenoid Coil	Spool Valve	Shafts and Coatings	Spool Valve Options
W - Worcester Controls	**XV** - Aluminum NEMA 4, 4x, 7 & 9 **CV** - Aluminum EEx d IIB **WR** - Resin NEMA 4, 4x **FR** - Resin I.S. Class 1, Div. 1 Groups A-D (F2 FOUNDATION Fieldbus protocol only)	**U** - UltraDome Indicator **C** - 90° 3-way **D** - 180° 3-way **E** - 180° 3-way Center Blocked	**M1** - (2) SPDT Mechanical **MG** - (2) SPDT Mechanical Gold Contacts **R4** - (2) SPST Proximity **P1** - (2) Sabre SPDT Proximity **PP** - (2) Phazer II SPDT Proximity **B4** - (2) BRS SPST Proximity **S4** - (2) P&F NJ2-V3-N (NAMUR) **SE** - (2) Efector Type IN-2002-ABOA **Communication Protocol** **F2** - 2-wire FOUNDATION Fieldbus **F4** - 4-wire FOUNDATION Fieldbus **FD** - PROFIBUS DP **FA** - AS-i **FN** - DeviceNet	**0** - Single Coil **1** - Dual Coil (WWR Series only) **2** - External Solenoid Coil (BUSwitch only F4 option)	**A** - 110 VAC 50/60 Hz **C** - 220 VAC 50/60 Hz **F** - 12 VDC **G** - 24 VDC **H** - 12 VDC Low Power **J** - 24 VDC Low Power **K** - 24 VDC Intrinsically Safe **BUSwitch Only** **G** - 24 VDC **J** - 24 VDC Low Power **P** - 24 VDC Piezo Ultra-Low Power (F2 Protocol only) **0** - None	**1** - 3-way Aluminum **2** - 3-way Stainless Steel **3** - 4-way Aluminum **4** - 4-way Stainless Steel	**N** - NAMUR Shaft **B** - Epoxy Coating/ NAMUR Shaft (WXV Series only)	**R** - Thermoplastic Rain Caps (Standard) **M** - Thermoplastic Rain Caps/Momentary Manual Override **L** - Thermoplastic Rain Caps/Locking Manual Override **X** - Sintered Bronze Exhaust Mufflers **Y** - Sintered Bronze Exhaust Mufflers/Momentary Manual Override **Z** - Sintered Bronze Exhaust Mufflers/Locking Manual Override **S** - Stainless Steel Exhaust Mufflers **T** - Stainless Steel Exhaust Mufflers/Momentary Manual Override **U** - Stainless Steel Exhaust Mufflers/Locking Manual Override

Fieldbusses for Process Control
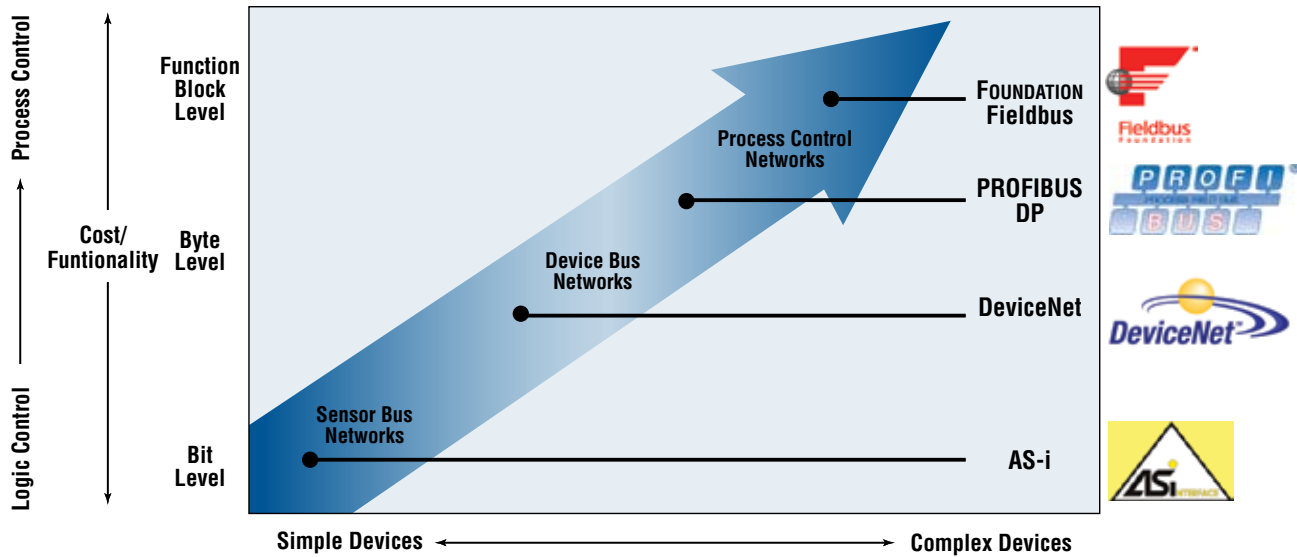
AS-i

- WGL, WPL and WXCL Series UltraSwitch (requires external 24 VDC solenoid valve)
- WWR and WXV Series BUSwitch with integral coil and spool valve
- Series 75 electric actuator

DeviceNet

- WGL, WPL and WXCL Series UltraSwitch (requires external 24 VDC solenoid valve)
- WWR and WXV Series BUSwitch with integral coil and spool valve
- Series 75 electric actuator

PROFIBUS DP

- WWR and WXV Series BUSwitch with integral coil and spool valve
- Series 75 electric actuator

FOUNDATION Fieldbus

- WWR, WFR and WXV Series BUSwitch with integral coil and spool valve
- Series 75 electric actuator

HART, Profibus PA, FOUNDATION Fieldbus

- L93 "Pulsair" positioner

	ASi(2.1)	PROFIBUS DP	FOUNDATION Fieldbus	DeviceNet
Max. No. of Devices/Segment	63	32	32	64
Cable Length (ft)	328-984	328 to 3937	2953	328-1640
Data Speed (kbps)	167	9.6 to 12,000	31.25	125 to 500

UltraSwitch™/Aviator™ Internal Switch Options

Mechanical Switches

Type 1 / M1
(2) SPDT Mechanical
15 amp @ 125 VAC,
½ amp @ 125 VDC
Minimum 50 mA

Type G / MG
(2) SPDT Mechanical
Gold-Plated Contacts
1 amp @ 125 VAC
1 amp @ 24 VDC
Minimum 1 mA
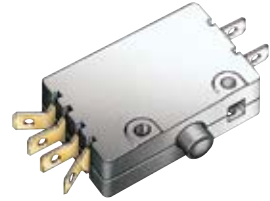
Type 3
(2) DPDT Mechanical
15 amp @ 125 VAC
Minimum 50 mA
Consult factory for DC voltages

Proximity Switches
hermetically sealed for
long life.

Type 4 / R4
(2) SPST Proximity
0.35 amp @ 140 VAC,
1 amp @ 50 VDC, 50 Watt Max.
Minimum 1 mA

Type 5
(2) SPDT Proximity
¼ amp @ 120 VAC,
¼ amp @ 28 VDC, 3 Watt Max.
Minimum 5 mA

Type 8
(2) Solid State Pepperl & Fuchs
Proximity
2-wire NAMUR per
DIN 19234

High Performance Proximity Switches
hermetically sealed for severe
service and long life.

Many additional switch
options are available.
Consult factory for details.

Type E / P1 Sabre Switch
(2) SPDT Proximity
1 amp @ 120 VAC,
1 amp @ 24 VDC, 25 Watt Max.
Minimum 1 mA

Type P / PP Phazer II
(2) SPDT Proximity
3 amp @ 120 VAC,
2 amp @ 24 VDC, 100 Watt Max.
Minimum 50 mA

Type T / B4 BRS
(2) SPST Proximity
3 amp VAC,
½ amp @ 24 VDC, 100 Watt Max.
Minimum 1 mA

AutoBrakits

NAMUR mounting kits and NAMUR shaft options permit direct
coupling of Automax limit switches or positioners to NAMUR
actuators. Our NAMUR shaft options include an integral
alignment pin to ensure accurate fit between accessory and
actuator. The kits feature stainless steel construction at an
economical price.
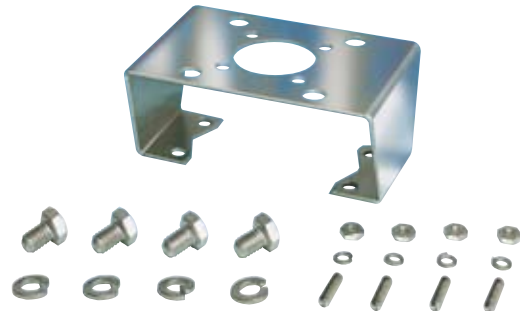
Material Guide for Harsh Environments

Worcester limit switch products are designed with harsh chemical environments in mind. Although users do not normally expose valve automation accessories directly to concentrated chemicals, mild concentrations do exist in plant atmospheres. This guide provides chemical compatibility for materials used in exposed parts, i.e., housings, covers and visual indicators.

WWR Series Aviator™/BUSwitch™ – General Electric Noryl®
Noryl®, a modified PPO resin, features high hydrolytic stability, meaning that it does not absorb moisture readily, making it well suited for high humidity and steam environments. Noryl offers good resistance to most acids, bases, detergents and aqueous solutions. Halogenated and aromatic solvents may soften or dissolve this material.

WPL Series UltraSwitch™ – DuPont Zytel®
Zytel®, a polyamide resin, features resistance to low concentrations of bases, solvents and salts. This high-strength engineered resin provides an excellent enclosure for harsh corrosive environments.

UltraDome™ & Pharos™ Visual Indicators – General Electric Lexan®
Lexan®, a polycarbonate resin, is extremely tough and generally is not affected by low concentrations of acids, alcohols and alkalis. High concentrations should be avoided. Mild detergents, pure petroleum greases and pure silicone greases are generally compatible. Avoid solvents.

WGL & WXCL Series UltraSwitch™, WXV Series Aviator™/BUSwitch™ - Dichromate Conversion Undercoat with Polyester Powder Top Coat
The dichromate conversion coating provides improved adhesion of the top-coat, retards mildew formation, and provides extra protection against oxidation, particularly on unpainted surfaces such as the interior. Polyester provides general protection against low concentrations of some acids and alkalis. Avoid bases. Optional epoxy coating provides better chemical resistance, but has a tendency to chalk under direct exposure to ultraviolet light.

Chemical	Concentration	Noryl®	Zytel®	Lexan®	Polyester	Epoxy
Acids						
Acetic	5%	E	C	C	U	U
Acetic	90%	E	U	—	U	U
Citric	5%	—	C	C	E	E
Formic	90%	—	U	U	U	E
Hydrochloric	10%	E	U	E	C	E
Nitric	10%	E	U	C (D)	U	E
Nitric	75%	C	U	C (D)	U	C
Phosphoric	5%	E	U	E	C	C
Sulfuric	5%	E	U	C	C	C
Sulfuric	30%	E	U	C	C	C
Bases						
Ammonium Hydroxide	10%	—	C (L)	U	U	E
Potassium Hydroxide	10%	E	C	U	U	E
Sodium Hydroxide	10%	E	C (L)	U	U	E
Solvents						
Acetone		—	C	U	U	U
Ethyl Acetate (Ester)		C	E	U	C	C
Methanol		E	E	U	E	E
Methylene Chloride		—	C	U	U	U
Toluene		—	E	U	C	E
Salts						
Sodium Bicarbonate		E	E	—	E	E
Sodium Chloride	10%	E	C (L)	E	E	E
Miscellaneous						
Ammonia		E	C	—	—	—
Chlorox		E	C	—	—	—
Mineral Oil		E	—	—	E	E

E = Excellent (chemical has no effect)
C = Compatible, but material slightly affected by chemical:
L = greater than 1% dimensional change
D = discoloration
U = Unsatisfactory (chemical attacked material)
— = No test data or experience available

FLOWSERVE

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For more information about Flowserve Corporation, visit
www.flowserve.com or call USA 1 800 225 6989.

flowserve.com