Corrosion Protection for Fisher® Valves

Control valves operate in some of the most severely corrosive conditions imaginable. Valves used near or on the sea are constantly subjected to corrosive salt-laden atmospheres. In chemical, pulp, and other processing plants, any variety of chemicals can be expected to be in contact with the exterior surfaces and fasteners. In addition, in-valve and ambient temperatures can cycle considerably. These are ideal conditions for corrosion of valve components and fasteners.

To protect your investment from attack and deterioration, Emerson Process Management protects exposed metal valve parts with excellent protective coatings for components and fasteners.

Stronger. Greener. Better. POWDER TOUGH COATED™

Powder Coating and NCF (Non-Corroding Finish) Coating Provide Attractive, Long-Lasting, and Cost-Effective Protection for Your Fisher Control Valve

Standard and Optional Coatings for Fisher Valves

Table 1. Coatings

COATING	STANDARD			PREMIUM OPTION
	Powder Coating	NCF (Non-Corroding Finish)	Heavy Zinc Plating	Offshore Coating System
Typical uses	Cast Iron and steel valve bodies; actuator yokes, casings, and cylinders	Steel bolts, studs, and nuts; yoke locknuts	Instrument feedback arms, valve-actuator stem connectors	Complete control valve assemblies with the exception of stem connectors, yoke locknuts, instruments, and instrument mounting hardware, (Instrument mounting plates and brackets are typically coated).

Contents

Table 2. Fisher Paint System (FPS) and System Descriptions

FPS-1A	Wet Spray Coating
General Description	Wet spray solvent or water borne primer and top coat are applied
Surface Condition	Parts must be clean and free of previously applied coatings. Iron phosphates may be applied
Number of Coats	2
Total Thickness	Total dry film thickness: 60 to 76.2 microns (2.5 to 3.0 mils) minimum
Temperature Limits	121°C (250°F) constant, 149°C (300°F) in intervals
ISO 12944 Expected Durability	Not Applicable
ISO 12944 Equivalent Paint System	None
FPS-2A	**Powder Coating**
General Description	Electrostatically applied heat cured powder coating
Surface Condition	Clean, iron phosphate, and final seal coat
Number of Coats	1
Total Thickness	Total dry film thickness: 50 microns (2 mils) minimum
Temperature Limits	121°C (250°F) constant, 149°C (300°F) in intervals
ISO 12944 Expected Durability	Not Applicable
ISO 12944 Equivalent Paint System	None
FPS-3	**Epoxy Primer and Top Coat**
General Description	Polyamide epoxy coating
Surface Condition	SSPC-SP6 (commercial blast clean)
Number of Coats	2
Total Thickness	Total dry film thickness: 125 to 254 microns (5 to 10 mils)
Temperature Limits	121°C (250°F) dry, 65°C (150°F) immersion
ISO 12944 Expected Durability	C3 (medium)
ISO 12944 Equivalent Paint System	A1.16
Notes	Not recommended for steel parts in highly corrosive service. Can be used with insulation.
FPS-3B	**Two-Coat Phenolic (Novalac) Epoxy**
General Description	Phenolic (novalac) epoxy coating
Surface Condition	SSPC-SP6 or SSPC−SP10
Number of Coats	2
Total Thickness	Total dry film thickness: 200 to 250 microns (8 to 10 mils)
Temperature Limits	218°C (425°F) continuous, 232°C (450°F) intermittent
ISO 12944 Expected Durability	C4 (high)
ISO 12944 Equivalent Paint System	A1.21
Notes	Can be used with insulation.
FPS-4	**Zinc Primer**
General Description	Inorganic zinc-rich coating
Surface Condition	SSPC-SP10 minimum (near white metal grit blast)
Number of Coats	1
Total Thickness	Total dry film thickness: 60 microns (2.5 mils) minimum
Temperature Limits	398°C (750°F) constant, 426°C (800°F) in intervals
ISO 12944 Expected Durability	Not Applicable
ISO 12944 Equivalent Paint System	None
Notes	Not for use with stainless steel. Uninsulated only.
FPS-7A	**High Temperature and Corrosive Applications**
General Description	Zinc-rich primer with silicone modified top coats
Surface Condition	SSPC-SP10 minimum (near white metal grit blast)
Number of Coats	3
Total Thickness	Typical total dry film thickness: 125 to 200 microns (5 to 8 mils)
Temperature Limits	537°C (1000°F) constant, 648°C (1200°F) in intervals
ISO 12944 Expected Durability	C3 (high) and C4 (low)
ISO 12944 Equivalent Paint System	A1.08
Notes	Can be used with insulation.

-continued-

Table 2. Fisher Paint System (FPS) and System Descriptions (continued)

FPS-7B	High Temperature and Corrosive Applications (Stainless)
General Description	Siloxane
Surface Condition	SSPC-SP10 minimum (near white metal grit blast)
Number of Coats	2
Total Thickness	Total dry thickness: 200 to 300 microns (8 to 12 mils)
Temperature Limits	599°C (1110°F) maximum constant
ISO 12944 Expected Durability	C3 (medium)
ISO 12944 Equivalent Paint System	A1.02
Notes	Coverage over stainless steel material only. Used against chloride attack and corrosive applications. Uninsulated only.
FPS-7C	**Modified Acrylic Topcoats with Color Option**
General Description	Inorganic zinc-rich primer and silicone acrylic topcoats
Surface Condition	SSPC-SP10 minimum (near white metal grit blast)
Number of Coats	3
Total Thickness	Typical total dry film thickness: 125 to 200 microns (5 to 8 mils)
Temperature Limits	Dependent on color
ISO 12944 Expected Durability	C4 (high)
ISO 12944 Equivalent Paint System	A1.13
Notes	Not for use with stainless steel. Semi-high temperature and corrosive. Can be used with insulation.
FPS-8A	**Three-Coat Offshore Applications**
General Description	Inorganic zinc-rich primer, polyamide epoxy mid-coat and aliphatic polyurethane top coat
Surface Condition	SSPC-SP10 minimum (near white metal grit blast)
Number of Coats	3
Total Thickness	Total dry film thickness: 212 to 337 microns (8.5 to 13.5 mils)
Temperature Limits	93°C (200°F) constant, 121°C (250°F) in intervals
ISO 12944 Expected Durability	C5-I and C5-M (medium)
ISO 12944 Equivalent Paint System	A1.20
Notes	Not for use with stainless steel. Can be used with insulation.
FPS-8B	**Four-Coat Offshore Applications**
General Description	Inorganic zinc-rich primer, two polyamide epoxy mid-coats and aliphatic polyurethane top coat
Surface Condition	SSPC-SP10 minimum (near white metal grit blast)
Number of Coats	4
Total Thickness	Total dry film thickness: 292 to 495 microns (11.5 to 19.5 mils)
Temperature Limits	93°C (200°F) constant, 121°C (250°F) in intervals
ISO 12944 Expected Durability	C5-M (high)
ISO 12944 Equivalent Paint System	A1.23
Notes	Not for use with stainless steel. Can be used with insulation.
FPS-8C	**Stainless Steel Body Applications in Corrosive Service**
General Description	Polyamide-cured epoxy primer and intermediate coat with aliphatic polyurethane top coat
Surface Condition	SSPC-SP10 minimum (near white metal grit blast)
Number of Coats	3
Total Thickness	Total dry film thickness: 250 to 355 microns (10 to 14 mils)
Temperature Limits	93°C (200°F) constant, 121°C (250°F) in intervals
ISO 12944 Expected Durability	Not Applicable
ISO 12944 Equivalent Paint System	None
Notes	Used with stainless steel. Can be used with insulation.
FPS-8D	**Optional Three-Coat Offshore Paint System**
General Description	Epoxy/zinc primer, polyamide epoxy mid-coat, and aliphatic polyurethane top coat
Surface Condition	SSPC-SP10 minimum (near white metal grit blast)
Number of Coats	3
Total Thickness	Total dry film thickness: 212 to 312 microns (8.5 to 12.5 mils)
Temperature Limits	93°C (200°F) constant, 121°C (250°F) intermittent
ISO 12944 Expected Durability	C5-I and C5-M (medium)
ISO 12944 Equivalent Paint System	A1.20
Notes	Not for use with stainless steel. Can be used with insulation.

Powder Coating

Powder coating is an electrostatically applied and baked-on finish consisting of a mixture of finely ground resin, pigments, and binders, very similar to wet-spray coatings. Unlike wet-spray coatings, however, powder coating is nearly 100% VOC free, thereby reducing some of the environmental concerns associated with wet-spray coatings.

Powder coating is the standard finish for actuator casings, yokes, and cylinders, as well as for cast iron and carbon steel valve body assemblies. During the powder coating process, the part is cleaned, and a conversion coating is formed on the substrate. A seal coat is then applied over the conversion coating. These steps prepare the part surface for the application of the powder coating and improve the adhesion of cured powder to the part. This pretreatment process is the foundation for the powder coating and is critical in assuring the durability of this coating in corrosive environments.

Powder coating has many of the attributes of catalyzed epoxy and urethane finishes, but Emerson Process Management powder coating does not have the disadvantage of chalking or discoloring when subjected to ultraviolet light such as sunlight.

Emerson Process Management has conducted extensive laboratory testing of powder coating, and this finish has been proven on valves in the field. Refer to table 4 for the comparative results of several coating systems.

Table 3. Powder Coating Specifications

TECHNICAL SPECIFICATIONS — POWDER COATING	
Surface Preparation	Clean, apply conversion coating, and seal coat
Coating Thickness	50 to 150 microns (2 to 6 mils)
Standard Acceptance Test	500 hours of ASTM B117 salt-spray conducted on products. For comparison test on test panels, refer to the "TEST" column in table 4
Standard Color Specifications	**Fisher Green:** Munsell #2.5G3/8 **Gray:** Munsell #10BG 4.90/0.60, ANSI/ASA #49 **Regal Gray:** Munsell #8.4B 3.47/0.60

Figure 1. Powder Coating is Nearly 100% Free of VOCs

W7163

Figure 2. Any Color of Powder Coating Can Be Specified; A Sampling of Available Colors are Shown on Actuator Casings

X1203

Powder Coating Test Results

Standardized flat-panel tests allow a good comparison between different types of coatings. However, these tests do not reflect performance on actual products. Refer to Technical Specifications (table 3) for the standard acceptance test for products. For more information about test conditions, procedures, and results, contact your Emerson Process Management sales office.

Table 4. Powder Coating Test Results

POWDER COATING TEST										
Surface Preparation: This coating was applied to Bonderite 1000 test panels.										
ASTM B117 Salt Spray	ASTM D522 Mandrel Bend	ASTM D3359 Cross-Hatch Adhesion	ASTM D2794 Direct Impact	Gasoline	15% Xylene and 85% Mineral Spirits	10% Nitric Acid	10% Hydrochloric Acid	3% Sulfuric Acid	10% Sodium Hydroxide	10% Ammonium Hydroxide
PASSED Up to 1000 hours: Rusting at scribe line. No loss of adhesion. No rust or blisters away from scribe.	PASSED No visible cracking or loss of adhesion.	PASSED No loss of adhesion. Rated 5B.	PASSED Up to 140 in/lb	PASSED Slight color change and slight softening, but recovered.	PASSED No effect	PASSED No effect	PASSED No effect	PASSED No effect	PASSED No effect	PASSED No effect

Powder Coating Compared to Other Coatings

Table 5. Coating Comparisons

<table>
<tr><th>COATING</th><th>COMMON APPLICATION</th><th>COMMENTS</th></tr>
<tr><td>Powder Coating</td><td>Used anywhere a durable, long-lasting, cost-effective coating is required.</td><td>Will withstand a continuous temperature exposure of 121°C or 250°F without detrimental effects
Passes all listed tests</td></tr>
<tr><td>Two-Component Epoxy—Primer and Top Coat</td><td>Not recommended. Does not exceed the powder coating results in any of these tests and is inferior in many aspects.</td><td>Will withstand a continuous temperature of 121°C or 250°F without detrimental effect.
Chalks and discolors when exposed to sunlight
Will not pass salt-spray testing
Will not pass mandrel-bend testing
Will not pass impact testing
Added cost</td></tr>
<tr><td>High-Temperature Modified Silicone Coating</td><td>Used where corrosive atmosphere is not a factor but where the body is subjected to temperatures up to 399°C or 750°F continuously.</td><td rowspan="2">Will not pass salt-spray testing
Will not pass mandrel-bend testing
Will not pass cross-hatch adhesion testing
Will not pass impact testing
Added cost</td></tr>
<tr><td>Inorganic Zinc-Rich Primer and High-Temperature Modified Silicone Top coat</td><td>Used where the application is corrosive and the body is subjected to temperatures up to 399°C or 750°F continuously.</td></tr>
<tr><td>Offshore Three-Coat System—Inorganic Zinc-Rich Primer, Epoxy Tie Coat, Polyurethane Top Coat</td><td>Used for applications that are highly corrosive but where temperatures will not exceed 121°C or 250°F on a continuous basis.</td><td>Will withstand a continous temperature exposure of 121°C or 250°F without detrimental effects
Will not pass mandrel-bend testing
Will not pass cross-hatch adhesion testing
Will not pass impact testing
Added cost</td></tr>
</table>

Figure 3. Powder Coating Results

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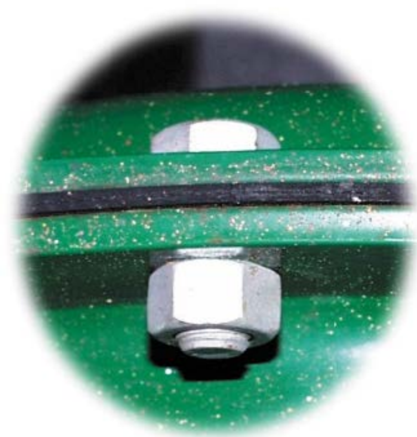
Powder-Coated Actuator Casings with NCF Coated Cap Screws after 500 Hours in an Accelerated Salt Spray Laboratory Test



W7697

Powder-Coated Actuator Casings with NCF Coated Cap Screws after One Year of Service on an Off-Shore Platform (Light-Colored Spots are Paint Drift from Customer Paint Spraying of Nearby Equipment)

Standard Instrument Paint

Standard paints applied to instruments are formulated to withstand extreme exposures to corrosive atmospheres and are tested to confirm this benefit. Due to the excellent surface preparation and superior coatings applied to the prepared substrate, other more expensive coating systems are not necessary. The coatings used for instruments are baked-on finishes that will withstand the toughest environments and will keep on performing for years to come.

Comparisons of paints other than standard have shown no advantages in using other paints. Because of the potential impact on instrument performance, we are unable to apply coatings or paints other than our standard.

Figure 4. Fisher Instrument with Standard Finish

W8049

Table 6. Standard Instrument Paint Specifications

Technical Specifications—Standard Instrument Paint	
Surface Preparation	Clean, desmut, apply chromate conversion coating
Coating Thickness	31 to 37 microns (1.25 to 1.5 mils)
Standard Acceptance Test	Refer to the standardized test chart for details
Standard Color Specifications	**Regal Gray**—Munsell #8.4 B 3.47/0.60 **Rosemount Blue**—Federal Standard 595A- #25177

Standard Instrument Paint Test-Panel Results

Standardized flat-panel tests show the effect of common chemical exposures and physical attributes. Tests were performed on chromate conversion coated aluminum alloy panels. For more information about test conditions, procedures, and results, contact your Emerson Process Management sales office.

Table 7. Standard Instrument Paint Panel Results

TEST	RESULT	TEST	RESULT	TEST	RESULT
Hot and Cold Cycle	No effect	10% NH_4OH	No effect	Mandrel Bend ASTM D522	PASSED
10% HNO_3	Slight loss of gloss to no effect	15% Xylene; 85% Mineral Spirits	Slightly lighter to no effect	Impact ASTM D2794	PASSED
10% HCL	No effect	Unleaded Gasoline	No effect	Thread-locking Sealant Resin	PASSED
3% H_2SO_4	No effect	Cross-Hatch Adhesion ASTM D3359	PASSED	Humidity, Ultraviolet, and Gravel Tests	PASSED
10% NaOH	Slight loss of gloss to no effect	Pencil Hardness ASTM D3363	PASSED	Salt Cabinet ASTM B117	PASSED

DVC6200 Stainless Steel Alternative

As an alternative to painted instruments, the FIELDVUE™ DVC6200 digital valve controller can be furnished with a stainless steel module base, housing and an all-stainless mounting kit. The sealed terminal box isolates field wiring connections from other areas of the instrument and keeps water and harsh atmosphere away from electronic components. The DVC6200 stainless steel version eliminates all diecast aluminum parts, which greatly increases its resistance to the tough, corrosive environments found on offshore platforms, within chemical plants, and inside refinery processing units.

Figure 5. Fisher DVC6200 Digital Valve Controller Stainless Steel Version

X0350

Proprietary NCF (Non-Corroding Finish) Coating for Steel Fasteners

Standard steel fasteners such as bonnet bolting, actuator casing bolting, and steel fasteners for Fisher instruments have NCF (non-corroding finish) coating.

NCF coating was developed by Emerson Process Management to greatly improve resistance to corrosion from acids, bases, salts, and many other chemicals and to follow the parameters listed in ASTM F1136 (Standard Specification for Zinc/Aluminum Corrosion Protective Coatings for Fasteners). NCF coating is a polymer-based coating consisting of multiple coats applied to all surfaces of bolts, studs, and nuts. (NCF coating is not used on steel bolting for temperatures over 427°C or 800°F). NCF coating is silver or gray in color and the finish is dull when compared with zinc plating.

The effectiveness of this proprietary coating designed specifically for the control valve market has been proven by actual testing on offshore platforms and accelerated salt-spray tests in the laboratory. NCF coated fasteners remain easily maintainable after offshore exposure. Original replacement NCF bolting is only available from Emerson Process Management.

Figure 6. NCF-Coated Fasteners Exhibit Superior Performance in Accelerated Laboratory Tests

W7698

STANDARD ZINC PLATED NCF COATED

Table 8. NCF Coating Specifications

Technical Specifications—NCF Coating	
Surface Preparation	**Pressure-retaining parts:** Light blast **Non pressure-retaining parts:** Light blast or zinc plating
Coating Thickness	Approximately 0.025 mm (0.001 inches)
Standard Acceptance Test	No red rust after 500 hours of ASTM B117 salt-spray test conducted on products after assembly with a pneumatic impact wrench
Color	Light silver-gray

Heavy Zinc Plating for Hardware Items

Figure 7. Heavy Zinc Plating Specifications

For hardware items such as instrument feedback arms and stem connectors, heavy zinc plating is standard. Heavy zinc plating is used for non-threaded parts that require protection from corrosion.

Table 9. Heavy Zinc Plating Specifications

Technical Specifications—Heavy Zinc Plating and Chromate	
Coating Thickness	0.0155 mm +/- 0.0025 mm (0.0006 inches +/- 0.000098 inches)
Standard Acceptance Test	300 hours in ASTM B117 salt-spray test

Offshore Three-Coat System (Optional)

This optional coating is often specified for valves used on offshore platforms. It is a wet-spray process consisting of three coats: a zinc-rich primer, polyamide epoxy, and polyurethane top coat.

This coating is applied to the complete control valve assembly with the exception of instruments, instrument mounting hardware, stem connectors, and yoke locknuts. The offshore three-coat system is not available on stainless steel parts.

Table 10. Offshore Three-Coat Specifications

Technical Specifications—Offshore Three-Coat System	
Surface Preparation	White metal grit blast per SSPC SP5.
Typical Coating Thickness	**Primer:** 25 to 75 microns (1 to 3 mils) **Tie Coat:** 75 microns (3 mils) **Top Coat:** 50 to 75 microns (2 to 3 mils)
Standard Acceptance Test	More than 2000 hours of ASTM B117 salt spray
Color	As specified

Neither Emerson, Emerson Process Management, nor any of their affiliated entities assumes responsibility for the selection, use or maintenance of any product. Responsibility for proper selection, use, and maintenance of any product remains solely with the purchaser and end user.

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