

Fisher™ Digital Isolation™ Solutions Selection Guide



Fisher Digital Isolation solutions are fully engineered, intelligent solutions with comprehensive product support and lifecycle services for critical safety and ESD valve assets leveraging Emerson's automation expertise with time-tested products.

Fisher Triple Offset Valve (TOV) SIS Solution

Figure 1. Fisher TOV SIS Solution, including Triple Offset Valve, Scotch-Yoke Actuator, and FIELDVUE™ DVC6200 SIS Digital Valve Controller with 775 THUM Adapter



This bulletin covers the 3rd party verified SIL 3 capable Final Element SIS solution from Emerson. The Fisher Digital Isolation solution is intended for use in process functional safety applications and can be configured to meet a wide range of SIS requirements using industry proven Emerson valves assemblies.

Features

- **Third Party Verified**—The Fisher Digital Isolation solution has been 3rd party verified which ensures all aspects of providing a SIS final element solution have been properly vetted. This includes design, engineering, assembly practices, and procedures as well as full documentation support.
- **Single SIL Certificate**—The Fisher Digital Isolation solution is supplied with a single SIL certification for the final element assembly rather than SIL certificates for each component. This reduces documentation complexity and systematic errors as well as time needed for SIL verification for the safety instrumented function.
- **Lower Failure Rates**—Third party verification via the Single SIL certification process allows for lower failure rates for the Digital Isolation solution than one would get by calculating the failure rates for the individual components. A lower assembly failure rate allows one to extend the proof test time intervals, resulting in increased productivity and cost savings.
- **Engineered Solution**—The Fisher Digital Isolation solution has been engineered to work seamlessly. Valve to actuator bracketry has been rigorously designed and stress-validated to ensure precise alignment with minimal angular twist. Valve torques have been tested and verified allowing for optimized actuator sizing.
- **Factory Acceptance Testing**—Each Digital Isolation solution goes through Factory Acceptance Testing (FAT) to ensure the final element correctly performs the safety function. Testing includes stroking time verification, partial stroke testing and solenoid health monitoring with full documentation.
- **One Company**—With the Fisher Digital Isolation solution you are dealing with just one company for the complete final element throughout the entire safety lifecycle.

The following products make up the core of the Digital Isolation offering. The purpose of this bulletin is to provide the necessary technical information to assist in solution selection.

Fisher Digital Isolation TOV SIS Solution – Valve Details

TOV Features
Torque assisted elastic metal seal provides zero leakage performance, ensures continuous optional bi-directional, zero leakage performance
Stellite® hardfaced standard integral seat results in broader applications, longer valve life and less maintenance
Single-piece cast body, with F-F dimensions in accordance to ISO 5752, ANSI B16.10 and API 609
All metal construction and sealing and zero leakage performance translate into an inherently firesafe valve
Long-length hardened bearings, incorporating a standard reinforced, die-formed, flexible graphite bearing protector ensure additional reliability
Internally and externally retained, three times blowout proof stem is safer to operate and provides complete compliance with API 609
Integral position indicators on the stem and the top mounting flange ensure positive disk position indication
Applications
Oil and Gas Processing, Offshore Platforms, Refineries
Hydrocarbon Storage and Transportation. Liquid Natural Gas (LNG) Storage and Transportation
Steam (Saturated and Superheated), Hydrocarbons, Hydrogen, Oxygen
Cryogenic Fluids, Hot Gases, Sulfur, Chlorinated solvents, Flare Gas
Specifications
Body Style: Double Flanged (ISO 5752), Lugged (API 609)
Pressure Class/Size
Basic Configuration: CL150: 3"-36", CL300: 3"-24", CL600: 6"-24" Cryogenic Configuration: CL150: 3"-24", CL300: 3"-24"
Basic Configuration: EN PN10-16-40: (80 mm - 600 mm), EN PN 63-100 (150 mm - 600 mm) Cryogenic Configuration: EN PN10-16-40: (80 mm - 600 mm)
Referenced Standards
Design standards: ANSI B16.34, API 609, EN 12516-1
Flange Drilling: ANSI B16.5, DIN PN16-25-40
Face-to-Face: Double Flanged - ISO 5752, Lugged - API 609
Fire Safety Test: API 607, ISO 10497
Pressure, Temperature and Shutoff Capability
Maximum Inlet Pressures: Full class rating per ASME B16.34/EN 1092-1
Temperature Range
Basic Configuration: CF8M/1.4408: -46°C to 427°C (-50°F to 800°F) WCC/1.0619: -28°C to 427°C (-20°F to 800°F)
Cryogenic Configuration: CF8M/1.4408: -254°C to +250°C (-425°F to 482°F)
Shutoff Class: Leakage in accordance with ISO 5208/EN 12516-1 (leakage rate A) and API 598 (resilient seated valves)

- continued -

Fisher Digital Isolation TOV SIS Solution – Valve Details (continued)

Standard Materials of Construction										
Size Range	NPS3-24 (30 and 36) ⁽¹⁾			DN80-600		NPS 6-24			DN150-600	
Pressure Class	CL150, CL300			PN16, PN25, PN40		CL600			PN63 - PN100	
Body	WCC	LCC	CF8M/CF3M	EN 10213-2	EN 10213-4	WCC	LCC	CF8M/CF3M	EN 10213-2	EN 10213-4
Disk	WCC	LCC	CF8M	EN 10213-2	EN 10213-4	WCC	LCC	CF85	EN 10213-2	EN 10213-4
Shaft	S41000	S41000	S20910	S41000	S20910	S41000	S41000	S20910	S41000	S20910
Packing	Graphite or Live Loaded	Graphite or Live Loaded	Graphite or Live Loaded	Graphite or Live Loaded	Graphite or Live Loaded	Graphite or Live Loaded	Graphite or Live Loaded	Graphite or Live Loaded	Graphite or Live Loaded	Graphite or Live Loaded
Seal Ring	S31803 + Graphite or S17400 Hard Faced	S31803 + Graphite or S17400 Hard Faced	S31803 + Graphite or S20910 Hard Faced	S31803 + Graphite or S17400 Hard Faced	S31803 + Graphite or S20910 Hard Faced	S31803 + Graphite or S17400 Hard Faced	S31803 + Graphite or S17400 Hard Faced	S31803 + Graphite or S20910 Hard Faced	S31803 + Graphite or S17400 Hard Faced	S31803 + Graphite or S20910 Hard Faced
Bearings	S31600 hard faced	S31600 hard faced	S31600 hard faced	S31600 hard faced	S31600 hard faced	S31600 hard faced	S31600 hard faced	S31600 hard faced	S31600 hard faced	S31600 hard faced

1. 30" and 36": CL150 in WCC and LCC only.

Cryogenic Materials of Construction	
Size Range	NPS3-24
Pressure Class	CL150, CL300
Body	CF8M/CF3M
Disk	CF8M
Shaft	S20910
Packing	Graphite or Live Loaded
Seal Ring	S20910 hard faced
Bearings	S31600 hard faced

Actuation

Figure 2. Fisher Scotch Yoke Type Actuator for Mounting to Fisher Rotary Valves



Fisher CBB	Fisher CBA-300	Fisher G/GC
Style		
Double-acting or spring-return pneumatic piston	Double-acting or spring-return pneumatic piston	Double-acting or spring-return series single power
Size Range		
315-725	730 to 1030	G01 to G8
Torque Range		
Double Acting: 673 in • lb to 12,992 in • lb	Double Acting: 7,388 in • lb to 20,377 in • lb	Double Acting: 7,765 in • lb to 2,273,134 in • lb
Spring Return: 194 in • lb to 4,972 in • lb (spring end)	Spring Return: 2,532 in • lb to 10,457 in • lb (spring end)	Spring Return: 9,626 in • lb to 1,219,134 in • lb (spring end)
Temperature Range		
Standard: -29°C to +93°C (-20°F to +200°F)	Standard: -29°C to +93°C (-20°F to +200°F)	Standard: -29°C to +93°C (-20°F to +200°F)
Optional High Temp: -18°C to +177°C (0°F to +350°F)	Optional High Temp: -18°C to +177°C (0°F to +350°F)	Optional High Temp: -18°C to +177°C (0°F to +350°F)
Optional Low Temp: -40°C to +66°C (-40°F to +150°F)	Optional Low Temp: -40°C to +66°C (-40°F to +150°F)	Optional Low Temp: -40°C to +66°C (40°F to +150°F)
Manual Override Options		
M3 Jack Screw	M3 Jack Screw, M11 Hydraulic Override	M3 Jack Screw, M11 Hydraulic Override
Safety Integrity Level		
SIL 3 Capable	SIL 3 Capable	SIL 3 Capable

Digital Valve Controllers

Figure 3. FIELDVUE Digital Valve Controllers



W9699_fb



X0076

DVC6200f PST	DVC6200 SIS
Construction	
Aluminum or Stainless Steel	
Temperature Limits	
-52 to 85°C (-62 to 185°F)	
Communication	
Foundation Fieldbus Communication	4 - 20 mA with HART 5 or 7 Communications
Feedback	
Linkageless, Non-Contact	
Enclosure Rating	
See Bulletin 62.1:DVC6200f PST D104160X012	See Bulletin 62.1:DVC6200 SIS D103555X012
Diagnostics	
PST, FST	PST, FST, Spurious Trip Protection, Solenoid Health monitoring
Safety Integrity Level	
NA	SIL3 Capable

Boosters, Regulators and Filters

Figure 4. Volume Boosters



X0648



W4727



X0206

VBL		2625		SS-263	
Material of Construction					
Aluminum		Aluminum or 316 SST		Aluminum or 316 SST	
Cv					
Supply: 2.5	Exhaust Port: 1.1 to 1.8	Supply: 3.74 to 4.98	Exhaust: 0.23 to 3.40	Supply: 9.5	Exhaust: 9.5
Temperature Limits					
-40 to 93°C (-40 to 200°F)		Standard: -40 to 71°C (-40 to 160°F) High Temperature: 0 to 121°C (32 to 250°F)		-40 to 71°C (40 to 160°F)	
Maximum Input Signal Pressure					
VBL-1 and VBL-3: 5.5 bar (80 psig) VBL-2 and VBL-4: 10.3 bar (150 psig)		10.3 bar (150 psig)		10.3 bar (150 psig)	
Connections					
Input: 1/4 NPT Supply and Output: 1/2 NPT		Input Signal: 1/4 NPT Supply and Output: 3/4 NPT		Input Signal: 1/4 NPT Supply: 1 NPT Output: 1 NPT or 1-1/4 NPT	
Safety Integrity Level					
SIL 3 Capable		SIL 3 Capable		SIL 3 Capable	
Additional Information					
Bulletin 62.3:VBL D103393X012		Bulletin 62.3:2625 D200071X012		Bulletin 62.3:SS-263 D103592X012	

Boosters, Regulators and Filters (continued)

Figure 5. Regulators



67CFR	67DFR	MR95H
Material of Construction		
Aluminum, Stainless Steel	Aluminum, Stainless Steel	Cast Iron, Steel, Stainless Steel
Cv		
0.36	1.33	0.8 to 12.5
Maximum Inlet Pressure		
17.2 bar (250 psig)	17.2 bar (250 psig)	17.2 bar (250 psig)
Outlet Pressure range		
15 to 150 psig	20 to 150 psig	5 to 150 psig
Temperature Limits*		
-29 to 82°C (-20 to 180°F)	-29 to 82°C (-20 to 180°F)	-29 to 82°C (-20 to 180°F)
Connections		
1/4 NPT	1/2 NPT	1/4 NPT to 2 NPT
Filter		
5 micron	5 micron	None
Additional Information		
Bulletin 71.1:67C D102656X012	Bulletin 71.1:67D D103152X012	Bulletin 71.1 D103742X012
* Nitrile Diaphragm		

Boosters, Regulators and Filters (continued)

Figure 6. Filters



X0648

262K	Headline 365A, 25-64-70C	Headline 383, 38-152-70C
Material of Construction		
Cast Iron, Stainless Steel	Aluminum	Aluminum
Cv/Flow Rate		
3.96	58 SCFM @ 150 psig	167 SCFM @ 150 psig
Maximum Inlet Pressure		
28 bar at 65°C (400 psig at 150°F)	150 psig	150 psig
Temperature Limits		
-28 to 208°C (-20 to 406°F)	49°C (120°F)	49°C (120°F)
Connections		
3/4 NPT	3/4 NPT	1 NPT
Filter		
40 microns	0.1 microns	0.1 microns
Additional Information		
Bulletin 90.1:262K D100205X012	---	---

Trip and Switching Valves

Figure 7. Trip Valves



W4292-1

377 Trip Valve	167D 2 Way Switching Valve	167DA 3 Way Switching Valve
Material of Construction		
Aluminum or Stainless Steel	Aluminum or Stainless Steel	
Uses		
With Piston actuators: Fail Up, Fail Down or Lock-in-Last on loss of supply pressure	Initiate safety function upon loss of supply pressure	
Cv		
0.5 to 0.6	0.96 to 1.81	
Supply Pressure		
3.8 bar (55 psig) to 10.3 bar (150 psig)	27.6 bar (400 psig)	8.6 bar (125 psig)
Outlet Pressure		
Normal Operation: Pressure from control device Fail-Up or Fail-Down Mode: Maximum volume tank pressure Lock-In-Last-Position: Respective cylinder pressure	0.21 to 10.3 bar (3 to 150 psig)	0.97 to 8.6 bar (14 to 125 psig)
Trip Point		
Minimum of 2.8 bar (40 psig) to a maximum of 72 percent of supply pressure	14 psig to 90 psig	
Temperature Limits*		
-40 to 82°C (-40 to 180°F)*	-29 to 82°C (-20 to 180°F)	
Connection		
1/4 NPT	1/4 NPT or 1/2 NPT	
Safety Integrity Level		
SIL 3 Capable	NA	
Additional Information		
Bulletin 62.3:377 D200318X012	Bulletin 71.7:167D D103235X012	
* Nitrile Diaphragm		

Solenoid

Figure 8. ASCO™ Solenoids



8327	8316	8362
Certification		
ATEX / IEC Ex, UL/CSA Approved	ATEX / IEC Ex, UL/CSA Approved	ATEX / IEC Ex, UL/CSA Approved
Port Size		
1/4 NPT	1/4, 3/8, 1/2 NPT	1/4, 3/8, 1/2, 3/4, 1 NPT
Style (ports/positions)		
3/2	3/2*	3/2*
Valve type		
Poppet	Poppet	Spool
Cv range		
0.49/0.56	1.5, 1.8, 4	2, 4, 4.8, 5, 5.6, 13, 15.5
Body Material		
Brass or 316 SST	Brass or 316 SST	Brass or 316 SST
Mounting		
Hard Piped	Hard Piped	Hard Piped
Operation		
Universal	Normally closed	Normally Closed
No. Coils		
Single	Single	Single
Voltage		
120/60 VAC or 24 VDC	120/60 VAC or 24 VDC	120/60 VAC or 24 VDC
Power		
12.0W / 11.6W	1.4W / 10.1W / 11.6W	1.4W / 10.1W
Temperature range		
-40°C to 55°C (-40°F to 131°F)	-40°C to 60°C (-40°F to 140°F)	-40°C to 60°C (-40°F to 140°F)
Direct/Pilot		
Direct Acting	Pilot Operated	Internal Pilot Operated
Safety Integrity Level		
SIL 3 Capable	SIL 3 Capable	SIL 3 Capable
*Others available upon request **T180°C: Temperature Class 180°C-120/60-110/50 or 230/50-240/50 Applications **T6: Temperature Class 85°C-12/DC, 24/DC, 48/DC or 120/DC Applications ***Additional ASCO Models available upon request		

DXP

Figure 9. TopWorx™ Discrete Valve Controller



D-ESD	DXP-Controller	DXP-L2 Switchbox
Enclosure		
Tropicalized Aluminum, SST or Resin	Tropicalized Aluminum	Tropicalized Aluminum
Enclosure Rating		
Explosion Proof, Cl I Div 1, Grps C-D; Cl I Div 2, Grps A-D; Type 4X; T4 -50°C ≤ Ta ≤ 60°C	Explosion Proof, Class 1 Div 1 Groups C,D Class 1 Div 2 Groups A,B,C,D	Explosion Proof, Class 1 Div 1 Groups C,D Class 1 Div 2 Groups A,B,C,D
Ex d IIB + H ₂ T6/T5/T4/T3 Gb; -50°C ≤ Ta ≤ 60°C/75°C/110°C/175°C	ATEX/IECx Zone 1 II2G,II2GD T6/T4/T3	ATEX/IECx Zone 1 II2G,II2GD T6/T4/T3
IP66	Ex d IIB + H2, Ex tb IIIC IP66/67	Ex d IIB + H2, Ex tb IIIC IP66/67
Communication		
Discrete	FOUNDATION Fieldbus, DeviceNet, AS-Interface, Profibus, HART protocols	HART optional with transmitter
Switches (Number and Type)		
(2) SPDT Reed Switches for ESD Module (1) SPDT GO Switch for PST	(2) GO Switches, SPDT hermetic seal (2) "L" GO Switches, SPDT hermetic seal* *Standard for DeviceNet, Profibus and AS-I; optional for HART and Foundation Fieldbus	(2) GO Switches, SPDT hermetic seal or (2) GO Switches, DPDT hermetic seal (2) "L" GO switches option
Analog Output		
NA	NA	optional 4-20mA transmitter (HART option)
Visual Display		
90 degree , Green/Open, Red/Close	90 degree , Green/Open, Red/Close	90 degree , Green/Open, Red/Close
Conduit Connection		
(2) 3/4 NPT	(2) 3/4 NPT	(2) 3/4 NPT
Temperature Range		
-40 to +80°C	-60 to 105°C (-75 to 221°F)	-60 to 105°C (-75 to 221°) -40 to 80°C (-40 to 176°F) w/transmitter
Pilot		
(1) 24VDC pilot, Fail Open/Closed (1) 110VAC pilot, Fail Open/Closed	(1) 24 VDC pilot, fail open/closed 0.5 W (non-I.S.)	NA
Spool Valve		
Aluminum Hard coat anodized (IP65) or SST	Aluminum Hard coat anodized (IP65)	NA
Spool Valve Cv		
1.2 Cv (1/4 NPT Ports) or 3.0 Cv (1/2 NPT Ports)	0.86 Cv (1/4 NPT Ports) or 3.7 Cv (1/2 NPT Ports)	NA
Safety Integrity Level		
SIL 3 Capable	SIL 2 Capable	SIL 2 Capable

Factory Acceptance Testing

Factory Acceptance Testing (FAT) is available in three classes to allow for customer selection to meet needs for a variety of applications for safety applications. Every Fisher Digital Isolation Solution assembly is subjected to product and performance testing in the factory prior to shipment.

- Class A** Assemblies will meet all functional performance and tests offered. This level should be selected only when superior performance is required in both valve stroking directions, or if an additional test is required
- Class B** Offers the optimum level of functional performance testing and documentation for a SIS or ESD application. This includes the basic functional requirement testing as well as proper setup of partial stroke testing (PST) with signature series documentation.
- Class C** Provides the most basic level of functional requirement testing, as listed in the table below. This includes valve stroke time under trip and supply droop. Hydrostatic and seat leak certificates for the valve will be provided.

Factory Acceptance Testing Requirements

Requirement	Requirement Description	Class A	Class B	Class C
1	Stroking Time Open Under Command Signal	x		
2	Stroking Time Closed Under Command Signal	x		
3	Valve Stroke Time Under Trip	x	x	x
4	Supply Droop	x	x	x
5	Partial Stroke Test	x	x	
6	Solenoid Valve Health Monitoring/Test	x		
7	Witness Factory Hydrostatic Test	x		
8	Witness Factory Seat Leak Test	x		
9	Double Block and Bleed Seat Leak Test ⁽¹⁾	x		
10	Factory Hydrostatic Test	x	x	x
11	Factory Seat Leak Test	x	x	x
12	Signature Series Documentation	x	x	

(1) Not applicable with 3000 TOV

Testing Definitions

Stroking Time Under Command Signal: Time for full stroke under instrument signal

Valve Stroke Time Under Trip: Time to reach desired position under a simulated trip condition

Supply Droop: Test to verify proper air supply flow rates

Partial Stroke Test: Diagnostic test to ensure valve operation and track wear

Solenoid Valve Health Monitoring/Test: Diagnostic test to ensure solenoid valve operation

Hydrostatic Test: Test to ensure valve shell integrity

Seat Leak Test: Test to measure leakage in the closed position

Double Block and Bleed Seat Leak Test: Test to ensure sealing capability against pressure for valves with multiple internal seats

Signature Series Documentation: Factory birth certificate of assembly performance to allow comparison with future valve signatures

Hookups

Hookup drawings for pneumatic and electrical accessories are available for the following standard configurations. Others are available upon request.

Option	Accessories Included*
1	Fisher Regulator/Filter + FIELDVUE Digital Valve Controller
2	Fisher Regulator/Filter + FIELDVUE Digital Valve Controller + ASCO Solenoid Valve
3	Fisher Regulator/Filter + FIELDVUE Digital Valve Controller + Fisher Volume Booster
4	Fisher Regulator/Filter + ASCO Solenoid Valve
5	Fisher Regulator/Filter + TopWorx
6	Fisher Regulator/Filter + ASCO Solenoid Valve + TopWorx Switchbox
7	Fisher Regulator/Filter + FIELDVUE Digital Valve Controller + ASCO Solenoid Valve + <i>Fisher Volume Booster (Optional)</i>
8	Fisher Regulator/Filter + FIELDVUE Digital Valve Controller + 1oo2 ASCO Solenoid Valve + <i>Fisher Volume Booster (Optional)</i>

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