

FastTest[®]
Your Productivity Connection

FI Series User Manual

Includes FI+ Connection Verification



INTRODUCTION

Copyright

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Scope

This manual supports Fastest Inc. components only. If special components, including but not limited to serial hubs, power supplies, PLC's are included based on a customer's specification or special request, it is the customer's responsibility to consult support materials and technical support specific to these special components provided by the third party manufacturers. Fastest Inc. assumes no liability for misuse, misapplication, or support for components that are not the FasTest Inc. brand.

Using the products in a manner not specified in this manual can impair the safety of operators and equipment.

We reserve the right to make alterations for the purpose of technical improvement.

Technical Support is available from: insidesales@fastestinc.com

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OVERVIEW

The FI Series delivers fast, leak free connections for vacuum and pressure testing, fluid filling or flushing applications. The connector seals internally to smooth tubes or threaded ports of many materials. Compressed air activates the seals for a leak tight, non-marring connection for air and liquid applications - even with rough and oily surfaces.

Optional Features:

CONNECTION VERIFICATION

The **Connection Verification™** feature provides the user an indication the connector has properly actuated to a calibrated position. As pilot pressure is applied to a FI+ connector, the “piston” moves in a linear manner which compresses the Main Seal on the test piece. **Connection Verification™** uses a sensor that measures internal piston travel which is calibrated to the user’s specific sealing range. After calibration, the connector will send a feedback signal each time the piston travels within the range set by the user.

Extended Shaft:

Connectors with extended shafts are designed for sealing remote ports or for applications requiring connectors to be offset rather than side-by-side mounting. This may be required when multiple test ports have close center-to-center distances. See Figure 1 for an example.



Figure 1. FI connector with extended shaft

Stroke Limiter:

All FI connectors are equipped with a stroke limiter. This feature will prevent over pressurization and excessive travel of the FI seals when pilot pressure is applied to an FI not placed in a test piece. Additionally, if an FI stroke limiter prevents sufficient pressurization for a sealing or testing application, it may be removed very easily without reducing the effectiveness of the connector.

Contents:

A new FI comes with the connector (1) and a seal set (2) as shown in Figure 2A. **Users must install the seal set before use.**



Figure 2A. FI connector and seal set

CONNECTION VERIFICATION

A new FI+ (Connection Verification) comes with only the base connector (1), **seal sets are sold separately. Users must install the seal set before use.** If the connector includes Connection Verification, a CV01 cable (3) will included, a CV02 cable will not be included. As shown in Figure 2B.

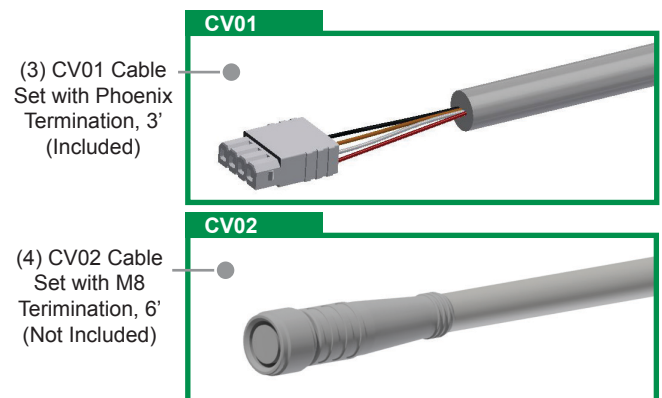


Figure 2B. Connection Verification cables

SPECIFICATIONS

Operating Pressure	Vacuum to 120 psi (8 bar)
Connection Profile	Internal Tubes, Bores and Threads
Termination Profile	Female 10-32" UNF, M5X8, NPT/BSPP: 1/8" to 2 1/2"
Mounting Port	Female 10-32" to 3/8-24" UNF, M5X8 to M11X1.5, 4-40" to 3/8-24" UNC
Pilot Port	Female 10-32" UNF, M5X8, 1/8" NPT/BSPP
Pilot Pressure	60-90 psi
Housing Material	Aluminum and Stainless steel
Seal Material	Standard: Neoprene, Urethane Optional: FKM (Viton), Buna-N or EPDM
Operating Temperatures	0°F to 200°F (-17°C to 93°C) Neoprene 32°F to 175°F (0°C to 79°C) Urethane

CV
NPN (max 100 mA load)
Supply voltage range: 8V to 24V
Over-voltage protection
Sealed electronics
Internal memory stores calibration points

CHART 1: Dimensions

FI Body Sizes	A	B	C	D	E	F	G	H	I	J	L
FI01 FIM01	1.98 (50.3)	1.25 (31.75)	10-32 UNF M5x0.8	10-32 UNF M5x0.8	0.80 (20.4)	.40 (10.2)	10-32 UNF M5x0.8	.313 (7.95)			0.48 (12.2)
FI11, FI2 FIM1, FIM2	2.44 (62.0)	1.57 (39.9)	1/8" NPTF 1/8 BSPP	1/8" NPTF 1/8 BSPP	1.02 (26.0)	.51 (13.0)	1/4-28 UNF M6x1.0	.42 (10.67)			0.62 (15.8)
FI13, FI4 FIM3, FIM4	2.61 (66.3)	2.36 (60.0)	1/8" NPTF 1/8 BSPP	1/8" NPTF 1/8 BSPP	1.60 (40.7)	.80 (20.4)	1/4-28 UNF M6x1.0	.655 (16.64)	.52 (13.20)	.41 (10.41)	1.10 (28.0)
FI15, FI6 FIM5, FIM6	3.68 (93.5)	3.49 (88.7)	1/2" NPTF 1/2 BSPP	1/8" NPTF 1/8 BSPP	2.31 (58.7)	1.16 (29.5)	1/4-28 UNF M6x1.0	1.05 (26.67)			1.62 (41.2)
FI17, FI8 FIM7, FIM8	3.36 (93.5)	4.20 (106.7)	3/4" NPTF 3/4 BSPP	1/8" NPTF 1/8 BSPP	3.00 (76.2)	1.50 (38.1)	1/4-28 UNF M8x1.25	1.42 (36.07)			1.67 (42.4)

Standard FI

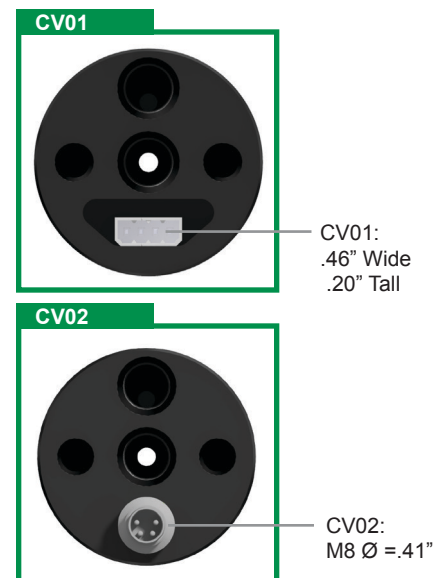
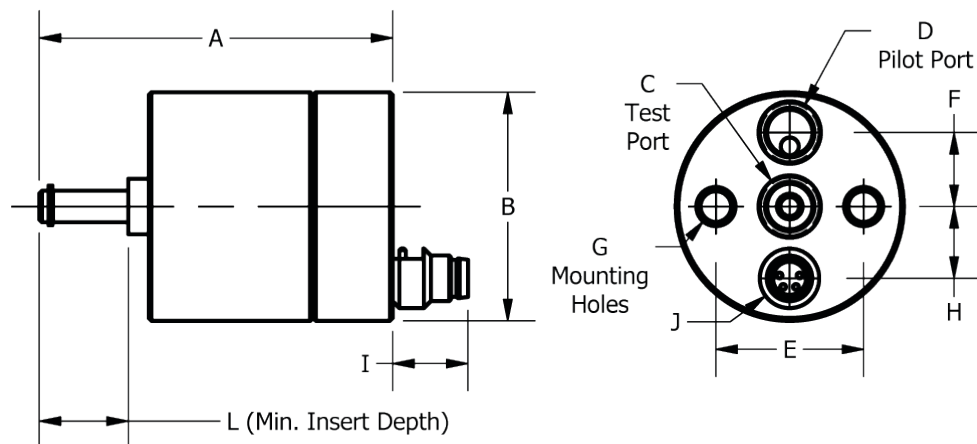


Figure 3. Connector Dimensional Features

INSTALLATION AND OPERATING INSTRUCTIONS

Standard and Connection Verification versions: read and understand each of the following procedures before operating the connector.

- A. Installation of New Seals
- B. Mounting the Connector
- C. Attachment of Pilot Pressure and Test Media Supply Lines
- D. Connector Operation Instructions

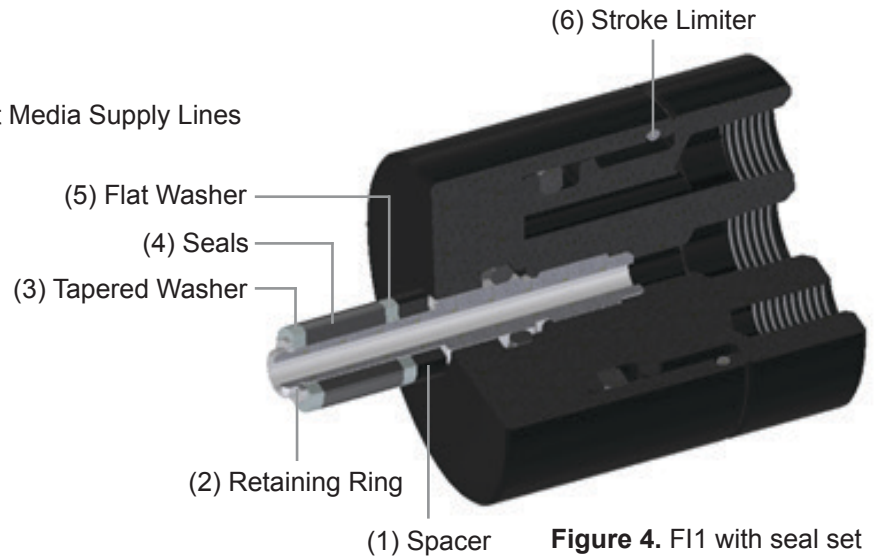


Figure 4. FI1 with seal set

A. Installation of New Seals

1. For new seal installation/replacement, remove retaining ring (2) from shaft tip and slide off old seal (4) and washers (3 & 5). Spacer (1) is to remain on connector shaft.
2. Seal Set contains elastomer seals, washers and retaining ring. Verify that seals and washers are the same size (outside diameter).
3. Assemble seal set onto shaft per Figure 4.
4. Attach new retaining ring to groove in shaft tip. Flat side of retaining ring must face away from washer.
5. A tapered washer with a counterbore is used at the shaft end on all FI01, FI1, FI2, FI3 and FI4 connectors. The retaining ring will be contained within the counterbore when pilot pressure is delivered to the connector.

B. Mounting the Connector

The connector must be secured to the test piece with a mechanical or other device to assure the connector is not uncoupled from the test piece by the uncoupling force of the test itself. The securing or holding device may be a fixture, clamp, cylinder or other appropriate means that prevents ejection of the test piece from the connector.

Uncoupling force example:

Test piece has a 1/2" O.D. and is tested at 100 psi maximum. Uncoupling force = area (πr^2) x pressure = $\pi(.25)^2 \times 100 \approx 20$ lbs. Secured device should be designed to withstand this force and include an adequate margin for safety. Do not activate the connector without an adequate and safe securing mechanism.

Mount the FasTest FI connector to the fixture or appropriate device using either threaded mounting holes on the rear of the connector body, or appropriate adapter.

C. Attachment of Pilot Pressure and Test Media Supply Lines

1. Attach pilot pressure line to pilot port “D”, Figure 5, page 9. Note: A pneumatic regulated source is required to maximize seal life and assure optimum seal-ability for the application. The pilot pressure should be minimized to maintain sealing on the test piece without excessive compression of seal. Excess pilot pressure may reduce the life of the seal
2. Attach test media line to test port “C”, Figure 5.
3. Provide a means whereby test pressure will not be introduced until pilot pressure required to seal is reached. The means should also provide quick exhaust of test pressure in the event pilot pressure falls below the minimum required to seal.

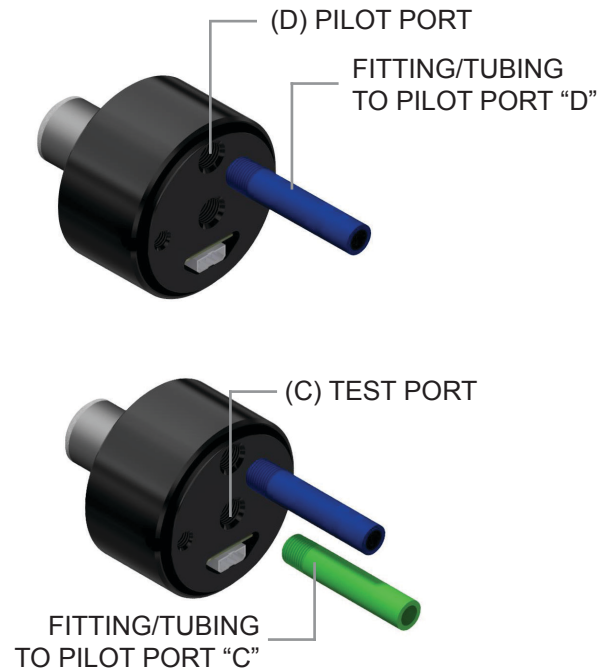
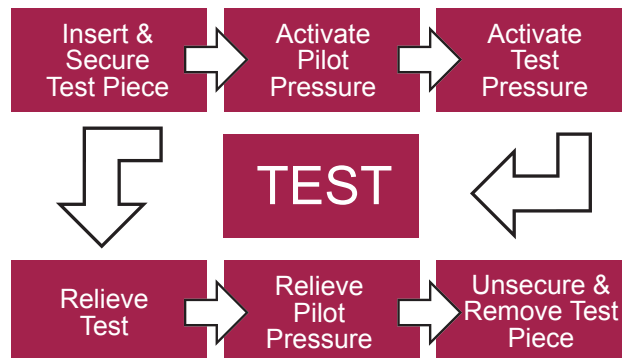


Figure 5. Attachment of Lines

D. Connection Operation

FasTest recommends that both the FI connector and the test piece are secured by mechanical devices before proceeding with the following sequence:

Activate connector testing sequence as shown below.



1. Place the test piece over the end of the connector and secure. Make sure the test piece is inserted to the required minimum insertion length. This will assure proper location relative to the seals. Make sure the connector and test piece are secure.
2. Apply pilot pressure to seal against the part. Generally, a 60 to 90 psi pneumatic pilot pressure source is required. CAUTION: Do not activate PILOT or TEST PRESSURE without test piece in place.
3. With pilot activated, introduce gas or liquid through the FasTest FI connector.
4. Perform testing operation.
5. Relieve test pressure.
6. Relieve pilot pressure.
7. Remove test piece.

CONNECTION VERIFICATION WIRING

CV01

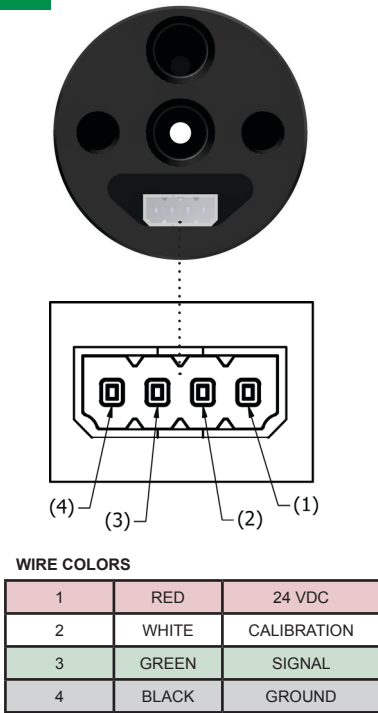


Figure 6. CV01 Pin Layout and Orientation

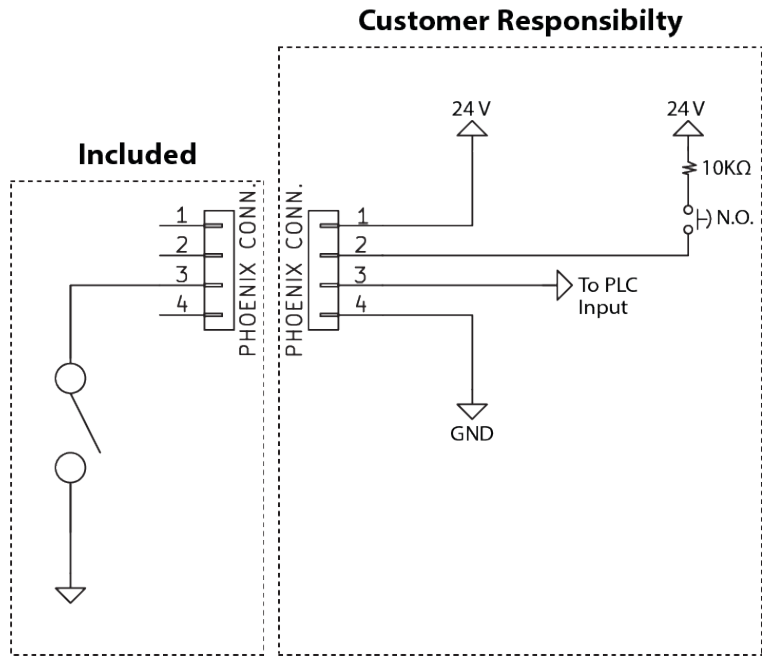


Figure 7. Typical PLC Application Electrical Diagram

CV02

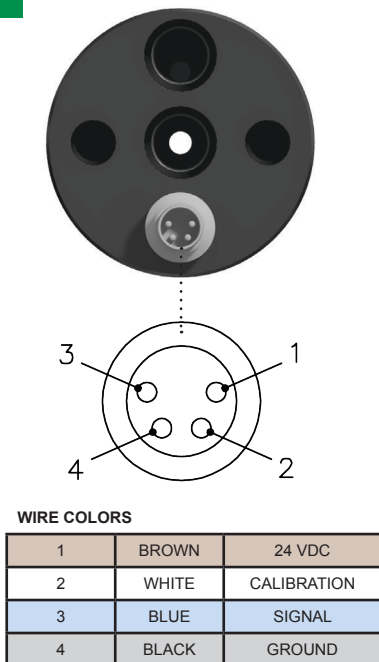


Figure 8. CV02 Pin Layout and Orientation

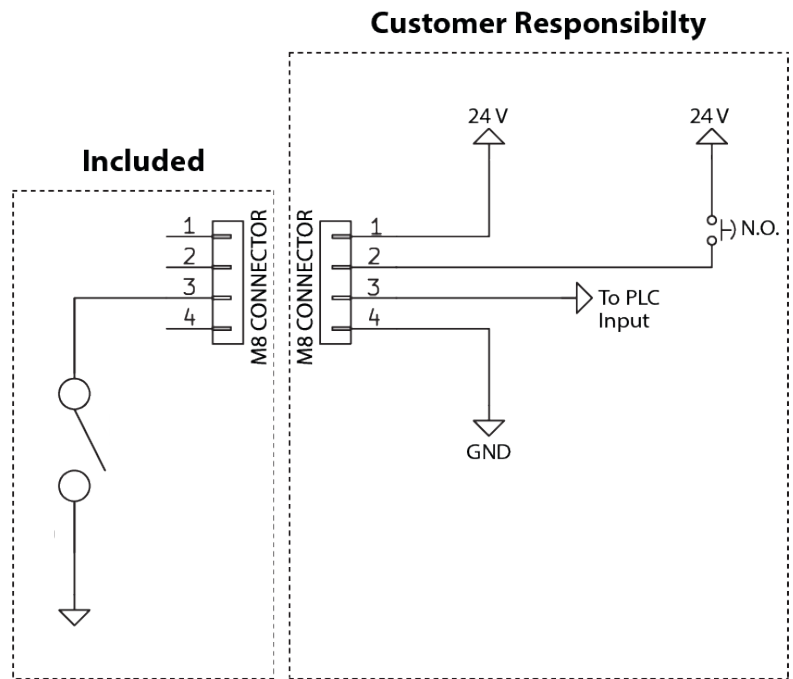


Figure 9. Typical PLC Application Electrical Diagram

MAINTENANCE AND CARE

A daily, weekly and periodic inspection of the connector by competent person is recommended. Lubricate connector on regular intervals. Petroleum jelly is recommended but care should be taken to verify the lubricant is compatible with the application. User must establish a regular interval for maintenance as determined by the user media and operational environment. Inspection should include damage to the body, missing or loose components, leak tightness, ease of operation, sufficient lubrication, wear, dirt accumulation and damage. Use only original FasTest spare parts that are designed for the application and are subject to strict quality control. See warranty.

- A. Replacing Main Seal
- B. Replacing Internal Seals
- C. Replacing Internal Seals on a Connector with **Connection Verification™**

A. Replacing Main Seal

1. If replacing seals only, inspect washers for warping, corrosion, or excessive wear.
2. Replace complete FasTest main seal set if washers are warped, corroded, or worn.
3. Always replace retaining ring when changing the main seal.
4. See “Installation of New Seals” for detailed instructions.

B. Replacing Internal Seals

1. Remove retaining ring, main seal set, and spacer.
2. Slide the housing forward until the stroke limiter is engaged.
3. Use a small pick to remove the snap/retaining ring. See Figure 10.
4. Use a small pick to remove the internal o-rings. See Figure 11.
5. Lubricate the new o-rings with petroleum jelly and re-install.
6. Re-install housing, stroke limiter, spacer, main seal set, and retaining ring.

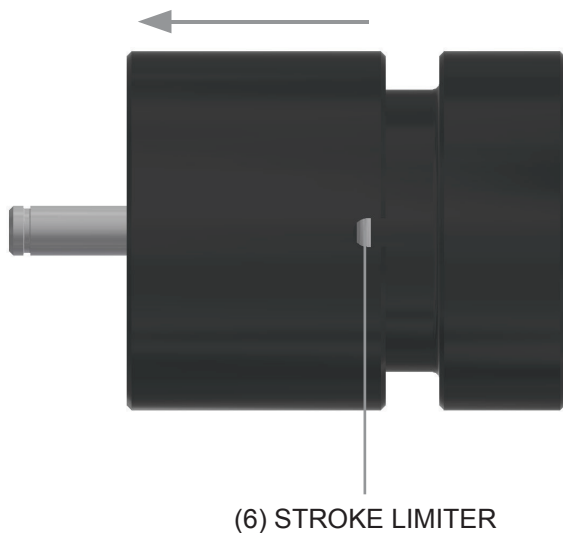


Figure 10. Removal of Stroke Limiter

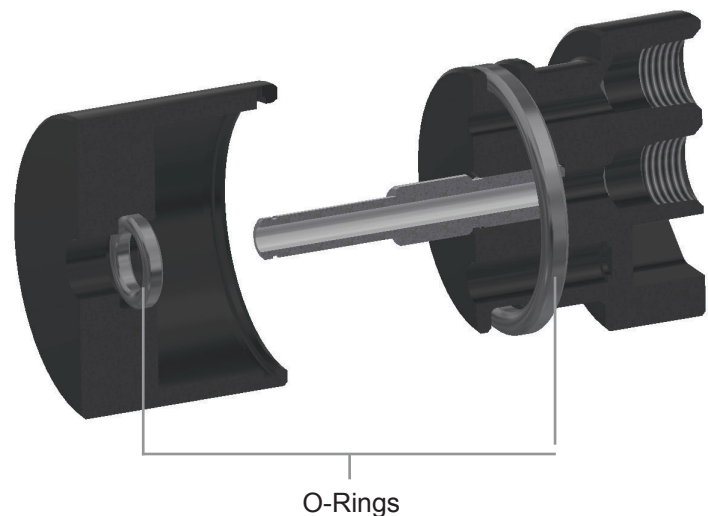


Figure 11. Removal of Internal O-Rings

CONNECTION VERIFICATION**C. Replacing Internal Seals on a Connector with Connection Verification**

1. Follow steps (1) through (3) from section B.
2. Take care when removing the piston because the actuator assembly can come out. See Figure 12.
3. Follow steps (4) through (6) from section B.

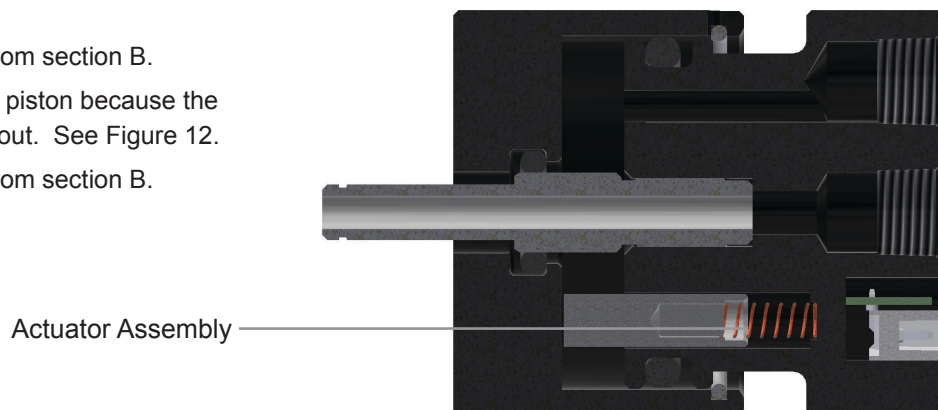
**Figure 12.** Actuator Assembly

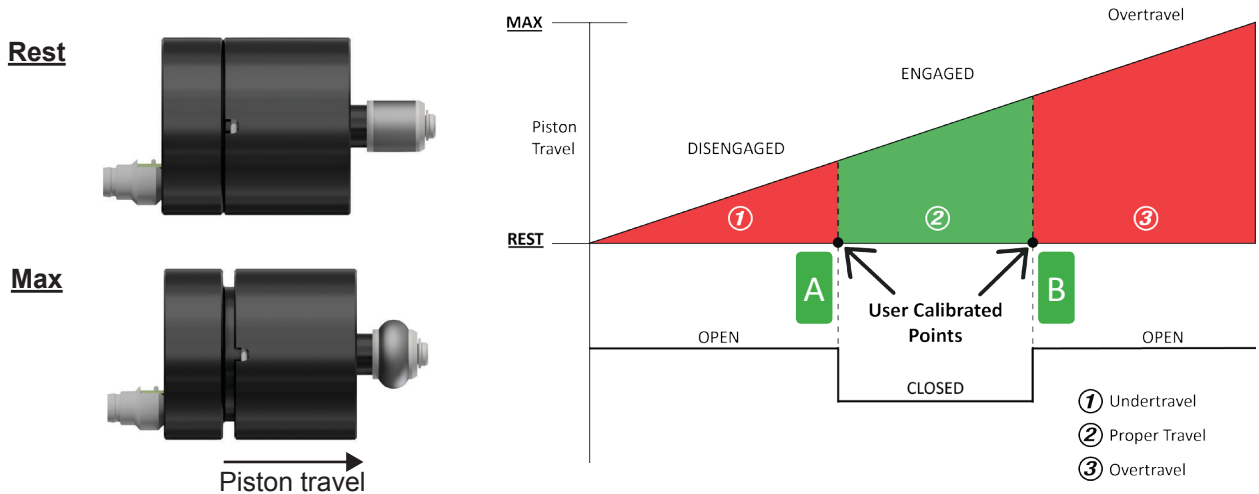
CHART 2: Connector Sealing Range

Model	FIS Seal Set	Sealing Range	No. of Seals	Flow Ø (in)
FI01	FIS01-01	.330 - .394	1	.06
	FIS01-1/8NPT	1/8 NPT	1	
FI1	FIS1-11	.394 - .472	1	.13
	FIS1-12	.472 - .551	1	
	FIS1-13	.551 - .630	1	
	FIS1-1/4NPT	1/4 NPT	1	
FI2	FIS2-21	.630 - .709	1	.17
	FIS2-22	.709 - .787	1	
	FIS2-23	.787 - .866	1	
	FIS2-3/8NPT	3/8 NPT	1	
	FIS2-1/2NPT	1/2 NPT	1	
FI3	FIS3-31	.866 - .945	2	.21
	FIS3-32	.945 - 1.024	2	
	FIS3-33	1.024 - 1.102	2	
	FIS3-3/4NPT	3/4 NPT	1	
FI4	FIS4-41	1.102 - 1.181	2	.28
	FIS4-42	1.181 - 1.260	2	
	FIS4-43	1.260 - 1.339	2	
	FIS4-1NPT	1 NPT	1	
FI5	FIS5-51	1.339-1.457	3	.56
	FIS5-52	1.457-1.575	3	
	FIS5-53	1.575-1.693	3	
	FIS5-1 1/4NPT	1 1/4 NPT	2	
FI6	FIS6-61	1.693-1.850	3	.72
	FIS6-62	1.850-2.008	3	
	FIS6-63	2.008-2.165	3	
	FIS6-1 1/2NPT	1 1/2 NPT	2	
FI7	FIS7-71	2.165-2.305	3	.92
	FIS7-72	2.305-2.445	3	
	FIS7-73	2.445-2.585	3	
	FIS7-2NPT	2 NPT	2	
	FIS7-2 1/2NPT	2 1/2 NPT	2	
FI8	FIS8-81	2.585-2.725	3	.92
	FIS8-82	2.725-2.865	3	
	FIS8-83	2.865-3.005	3	

- Note: Standard main seal material is Neoprene. NPT seals are Urethane. Use of less than the listed number of seals (for less insertion depth) requires a spacer. See FasTest catalog. Seal Installation Instructions included with seal sets.

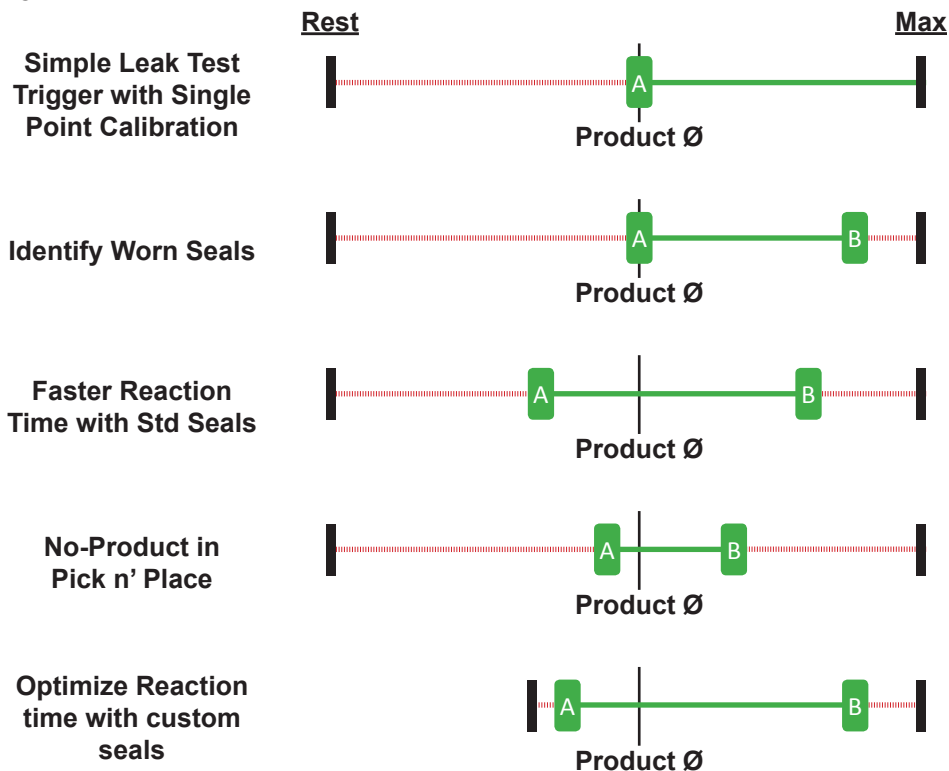
CONNECTION VERIFICATION CALIBRATION

Connection Verification™ enabled connectors need to be calibrated to each application. **The FI+ connector retains calibration point(s) even when power is removed.** Due to the fine sensor resolution and variations in seal height, calibration is recommended each time seals are replaced or the connector is re-built.



Each time the connector is actuated; a piston slides forward and settles at a final position. To get consistent piston travel; pilot pressure, product under test, connector placement, and main seal must be consistent. If one of those attributes changes, piston travel will change and our system can be setup to alert operators.

The connector stores a “good point” or a “good range” depending on the application. Below are suggested calibration options:



Calibration points may need to be re-calibrated as the main seal wears.

CONNECTION VERIFICATION CALIBRATION

The connector has two calibration procedures that provide flexibility for different applications.

Calibration Process 1 – “Single Point Calibration”

Designed for quick calibration and users that only need to know that the connector actuated to a certain point, e.g. leak testing.

1. Place product or Device Under Test (DUT) into FI+
2. Apply pilot pressure
3. Apply 8-24V to pin #2 and hold for 2 seconds to define point A (Refer to Figure 13) - Output signal begins “flashing” (alternating between open and closed states) to signify the user has entered calibration mode
4. Wait 30 seconds for calibration mode to timeout – Output signal will remain in closed state
5. Remove pilot pressure and DUT - Output signal will switch to open state
6. Insert DUT and cycle pilot pressure to confirm proper output

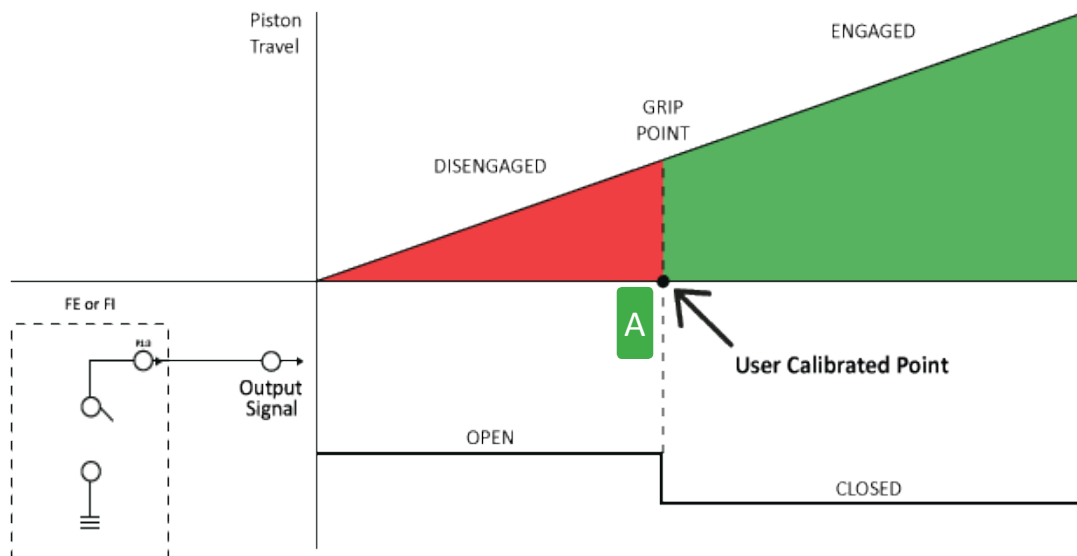


Figure 13. Single Point Calibration Graph

CONNECTION VERIFICATION CALIBRATION

Calibration Process 2 – “Dual Point Calibration”

Process 2 is for applications that require greater control and recognition of overtravel conditions.

e.g. automated leak testing and pick-n-place applications.

NOTE: steps 4-7 must be completed within 30 seconds

1. Place DUT into FI+
2. Apply pilot pressure
3. Apply 8-24V to pin #2 for 2 seconds to define point A (Figure 14). After Pin #2 is re-opened (no voltage applied), a 30 second calibration timeout clock initiates. *The output signal begins “flashing” or alternating between open and closed states to signify the user has entered calibration mode.*
4. Remove pilot pressure and DUT
5. * Place a sample piece over the main seal that represents point B (user determines size)
6. Apply pilot pressure
7. Apply 8-24V to pin #2 for 2 seconds to set point B and wait for calibration timeout (Refer to Figure 12) - Output signal will remain in closed state
8. Remove pilot pressure and DUT - Output signal will switch to open state
9. Insert DUT and cycle pilot pressure to confirm proper output

* Point B sample piece represents a location of the piston at the maximum allowable limit. In an FI connector this would be a larger diameter cylinder than the DUT. **The size of the sample piece (calibration range) must be determined by the customer in their specific application.**

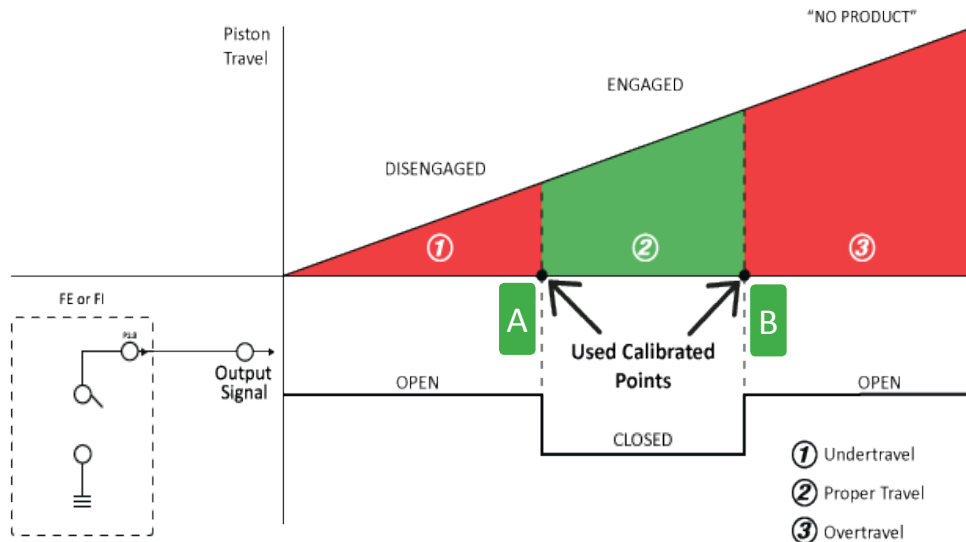


Figure 14. Dual Point Calibration Graph

TROUBLESHOOTING

<p>How does measuring piston travel correlate to verified connections?</p>	<p>By calibrating the movement of the piston, you are able to ensure a consistent connection. If the piston stops outside of the calibrated zone, you know that something in the setup has changed.</p>
<p>How do I know what calibration range to set?</p>	<p>It is application dependent and will require investigation by each specific user.</p>
<p>What impacts will the calibration range have on my test setup?</p>	<p>Larger range creates more consistent results, smaller ranges make the test more accurate but are more sensitive to variables such as pilot pressure, test piece, temperature, mounting, etc</p>
<p>Do I need to re-calibrate after changing seals?</p>	<p>It depends on the sensitivity of the range. The seals can vary up to 0.040 making this possible w/ a larger range</p>
<p>Does the connector retain calibration points if it loses power?</p>	<p>Yes, the calibration points are stored on internal memory.</p>

For any other questions, contact: insidesales@fastestinc.com

WARRANTY

FasTest Inc. warrants its products against defects in workmanship and materials for 12 months from the date of sale by FasTest Inc. or its authorized distributor. This warranty is void if the product is misused, tampered with or used in a manner that is contrary to FasTest Inc.'s written recommendations and/or instructions.

FasTest Inc. does not warrant the suitability of the product for any particular application. Determining product application suitability is solely the customer's responsibility. FasTest Inc. is not liable for consequential or other damages including, but not limited to, loss, damage, personal injury, or any other expense directly or indirectly arising from the use of or inability to use its products either separately or in combination with other products.

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