FASTEST

FE Series

User Manual

Including ICON™ information

www.fastestinc.com

INTRODUCTION

Copyright

Scope

This manual supports FasTest Inc. products 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 products 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: **fastsales@fastestinc.com**

Edition: WP007 Rev G; 3/17/2020 En

Table of Contents

OVERVIEW

The FE Series delivers fast, leak free connections for vacuum and pressure testing, fluid filling or flushing applications. The connector seals externally to smooth tubes or threaded fittings 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:

ICON - Intelligent Connection:

SURE SEAL™

Instant feedback verifies a good connection has been made and recognizes a failure prior to starting a test. Isolate your product, improve first pass yield, and collect data on connection status.

SEAL LIFE™

Automatically alert operators the main seal has worn and must be replaced. Prevent wasteful false failures while optimizing maintenance programs.

Contents:

Two parts are needed to make a functioning connector:
the base connector (A) and a seal set (B) as shown in Figure 1A.
Users must install a seal set into the connector before use.

Figure 1A. FE connector and seal set

Note: Seal sets contain elastomer seals and washers. For a complete listing of seal set size ranges see catalog.

ICON™

A new FE with ICON™ comes with only the base connector (A), **seal sets (B), and cable sets (C) are sold separately. Users must install the seal set before use.**

Figure 1B. ICON™ cable

SPECIFICATIONS

Operating Pressure	500 psi (34 bar)
Connection Profile	External Tubes and Threads
Termination Profile	Female 10-32" UNF, M5X8, NPT/BSPP: ⅛" to 2½"
Mounting Port	Female 10-32" to ⅜-24" UNF, M5X8 to M11X1.5, 4-40" to ⅜-24" UNC
Pilot Port	Female 10-32" UNF, M5X8, ⅛" NPT/BSPP
Pilot Pressure	60-600 psi
Housing Material	Aluminum and Stainless Steel, and Potting Material
Seal Material	Standard: Neoprene, Urethane Optional: FKM (Viton), Buna-N or EPDM
Operating Temperatures	0°F to 250°F (-17°C to 37°C) Neoprene 32°F to 180°F (0°C to 37°C) Urethane 0°F to 100°F (-17°C to 37°C) Intelligent Connection Technology

ICON™

- SSR (max 100 mA load) Analog (0-10V)
- Supply voltage: 24V
- Sealed electronics
- Internal memory stores calibration points

CHART 1: Dimensions

FE Body Sizes	A	B	C	D	E	F	G	L	H CV04 Only	J CV04 Only	K CV04 Only	M CV04 Only
FE001 **FEM001**	1.72 (42.7)	.084 (21.6)	⅛ NPTF ⅛ BSPP	10-32 UNF M5x.8	0.63 (16.0)	N/A	4-40 UNC M2.5x.45	0.16 (4.1)	N/A	N/A	N/A	N/A
FE01 **FEM01**	2.05 (52.1)	1.49 (37.9)	⅛ NPTF ⅛ BSPP		1.10 (28.0)	.55 (14.0)	10-32 UNF M5x.8	0.58 (14.8)	0.52 (13.2)			0.26 (6.6)
FE1 **FEM1**	2.72 (69.1)	2.22 (56.4)	¼ NPTF ¼ BSPP		1.62 (41.2)	.81 (20.6)		0.61 (15.5)	0.82 (20.8)			0.57 (14.5)
FE2 **FEM2**	3.50 (88.9)	3.11 (79.0)	½ NPTF ½ BSPP		2.50 (63.5)	1.25 (31.75)	¼ - 28 UNF M6x1	1.06 (27.0)	1.24 (31.5)			0.98 (24.9)
FE3 **FEM3**	4.48 (113.8)	4.23 (107.5)	1 NPTF 1 BSPP	⅛ NPTF ⅛ BSPP	3.25 (82.6)	1.63 (41.5)		1.64 (41.7)	1.7 (43.2)	0.55 (14.0)	.41 (10.41)	1.45 (36.8)
FE4 **FEM4**	4.60 (116.9)	5.48 (139.2)	1½ NPTF 1½ BSPP		4.25 (108.0)	2.13 (54.2)		1.64 (41.7)	2.31 (58.7)			2.05 (52.1)
FE5 **FEM5**	4.60 (116.9)	6.98 (178.0)	2 NPTF 2 BSPP		5.50 (139.7)	2.25 (57.2)	⅜ - 24 UNF M11x1.5	1.64 (41.7)	2.85 (72.4)			2.60 (66.0)
FE6 **FEM6**	4.97 (136.3)	7.48 (190.0)	2½ NPTF 2½ BSPP		6.12 (155.5)	3.06 (77.8)		1.64 (41.7)	3.30 (83.3)			3.05 (77.5)

FE

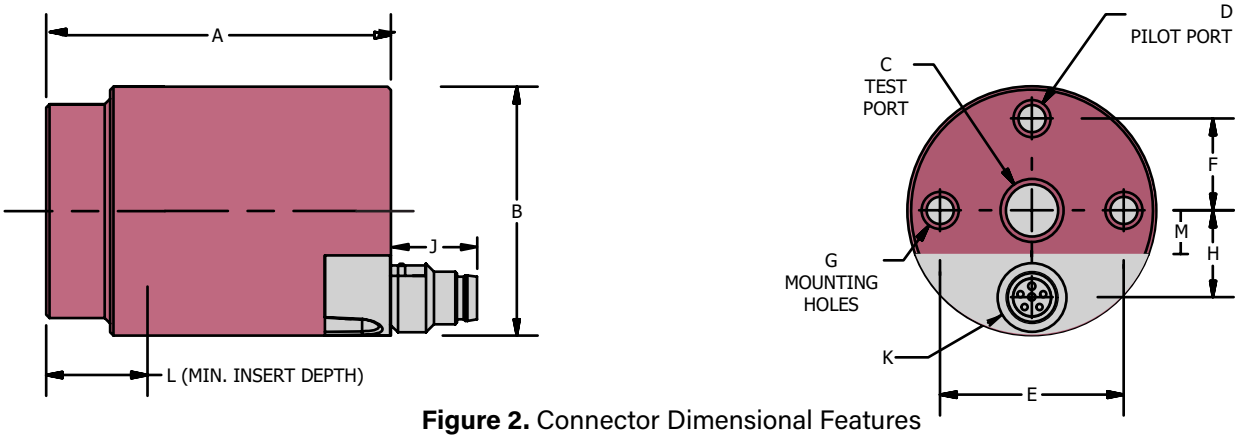


Figure 2. Connector Dimensional Features

INSTALLATION AND OPERATING INSTRUCTIONS

Standard and ICON™ versions: read and understand each of the following procedures before operating the connector:

1. Installation of Seals
2. Mounting the Connector
3. Attachment of Pilot Pressure and Test Media Supply Lines
4. Sure Seal™ Wiring
5. Connector Operation Instructions

1. Installation of Seals

1.1. For seal install or replacement loosen set screw (A) on side of housing.

1.2. Unscrew (counterclockwise) and remove seal casing (B). NOTE: A spanner wrench hole (C) is provided for breaking the seal casing loose if required.

Note: Seal sets contain elastomer seals and washers. For a complete listing of seal set size ranges see catalog.

1.3. Seal set contains elastomer seals and washers. Verify that seals and washers are the same sizes. Assemble seal set (D) into seal casing (B) per Figure 3.

1.4. Reassemble and tighten seal casing (B) with seal set (D) to housing.

1.5. Retighten set screw (A).

*Piston does not need to be removed to install seal set.

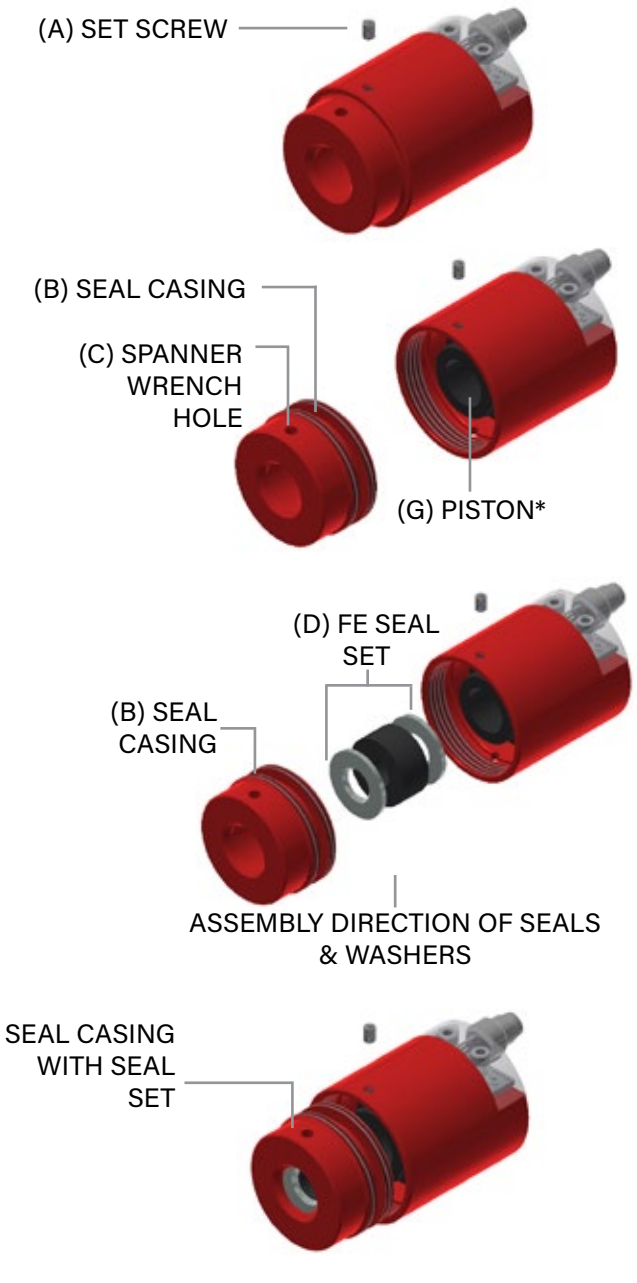


Figure 3. Installation of Seals

2. Mounting the Connector

The connector must be secured to the test piece with a mechanical or another 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:

The test piece has a ½" O.D. and is tested at 100 psi maximum. Uncoupling force = area (πr^2) x pressure = $\pi(.25)^2$ x 100 ≈ 20 lbs. The 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 FE connector to the fixture or appropriate device using either threaded mounting holes on the rear of the connector body or appropriate adapter.

3. Attachment of Pilot Pressure and Test Media Supply Lines

3.1. Attach pilot pressure line to pilot port (D) from Figure 4
Note: A regulated pneumatic 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 the seal.

3.2. Attach test media line to test port (C) from Figure 4.

3.3. Provide a means whereby test pressure will not be introduced until the 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.

Note: Test and pilot pressure should not be regulated by the same regulator. Failure to comply may result in harm.

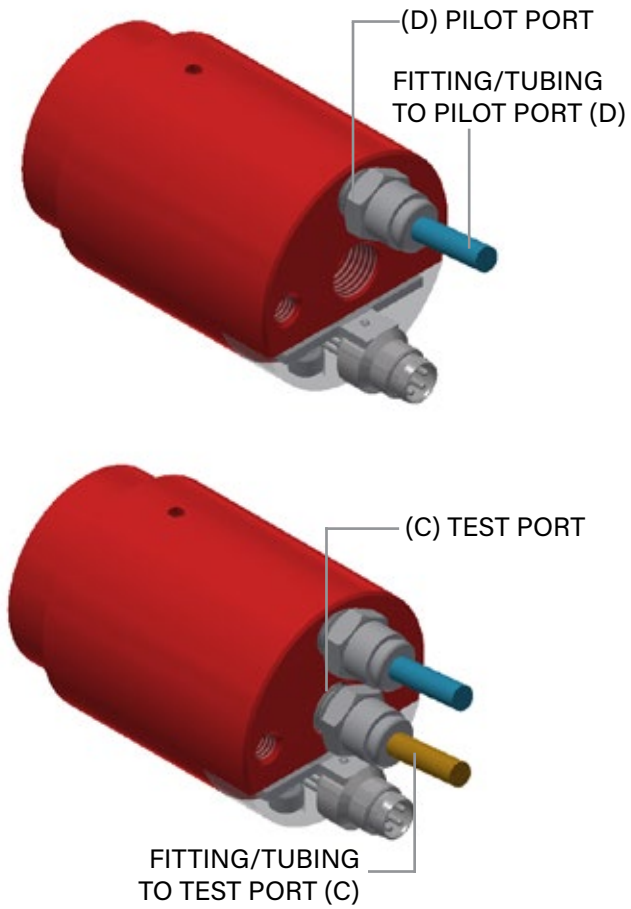
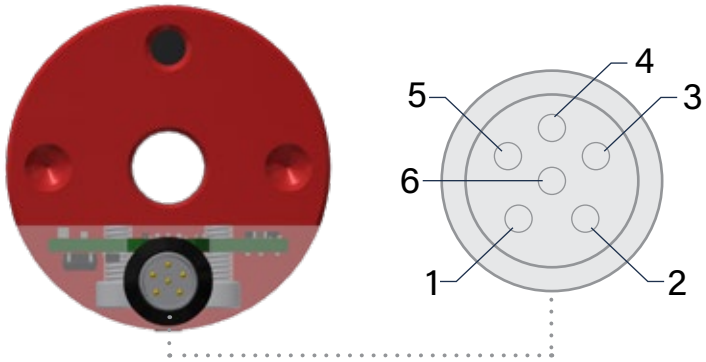


Figure 4. Attachment of Pilot and Media Lines

4. ICON™ WIRING



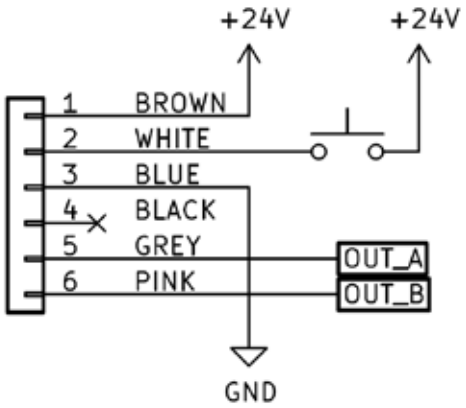


Figure 5A. Solid State Relay Application Electrical Diagram

Pinout/Standard M8 Cables		
Pin Number	**Wire Color**	**Description**
1	BROWN	24 VDC
2	WHITE	CALIBRATION
3	BLUE	GROUND
4	BLACK	NC
5	GREY	SSR CONTROL A
6	PINK	SSR CONTROL B

Figure 5B. CV04 SSR Pinout

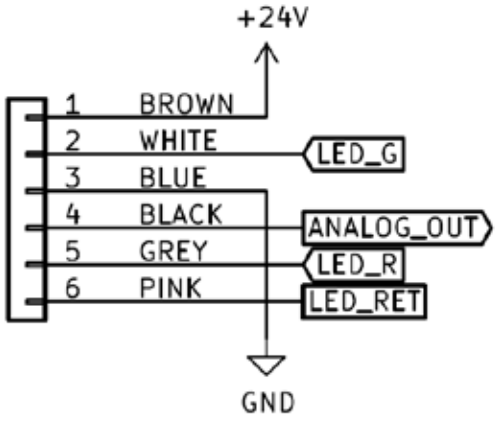


Figure 6A. Analog Application Electrical Diagram

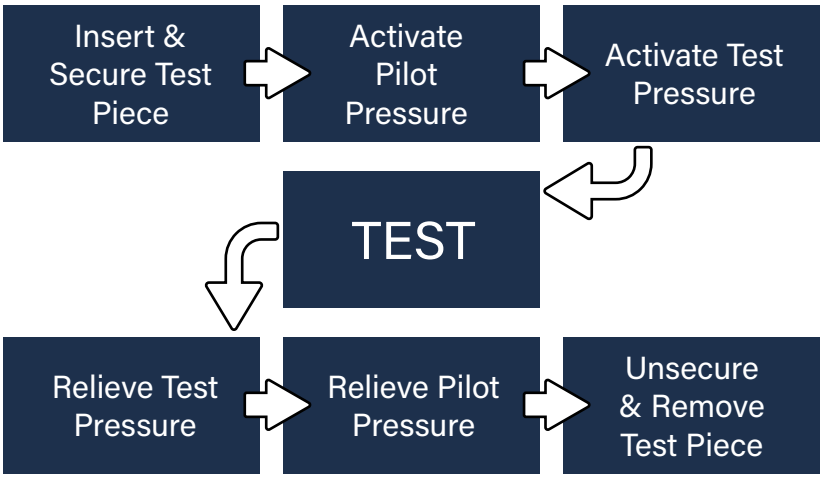
Pinout/Standard M8 Cables		
Pin Number	**Wire Color**	**Description**
1	BROWN	24 VDC
2	WHITE	LED GREEN
3	BLUE	GROUND
4	BLACK	ANALOG OUT-PUT
5	GREY	LED RED
6	PINK	LED RETURN

Figure 6B. CV04 Analog Pinout

5. Connector Operation

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

Activate the connector testing sequence as shown below.



5.1. Insert test piece into the end of the connector and secure. Make sure the test piece is inserted into the required minimum insertion length. This will assure proper location relative to the seals. Make sure the connector and test piece are secure.

5.2. Apply pilot pressure to seal against the part. Generally, a 60 to 90 psi pneumatic pilot pressure source is required. Additional pilot pressure may be required for contoured surfaces (i.e., threads etc.). See FasTest catalog for Pilot Pressure Booster. CAUTION: Do not activate PILOT or TEST PRESSURE without test piece in place.

5.3. With pilot activated, introduce gas or liquid through the FasTest FE connector.

5.4. Perform testing operation.

5.5. Relieve test pressure.

5.6. Relieve pilot pressure.

5.7. Remove test piece.

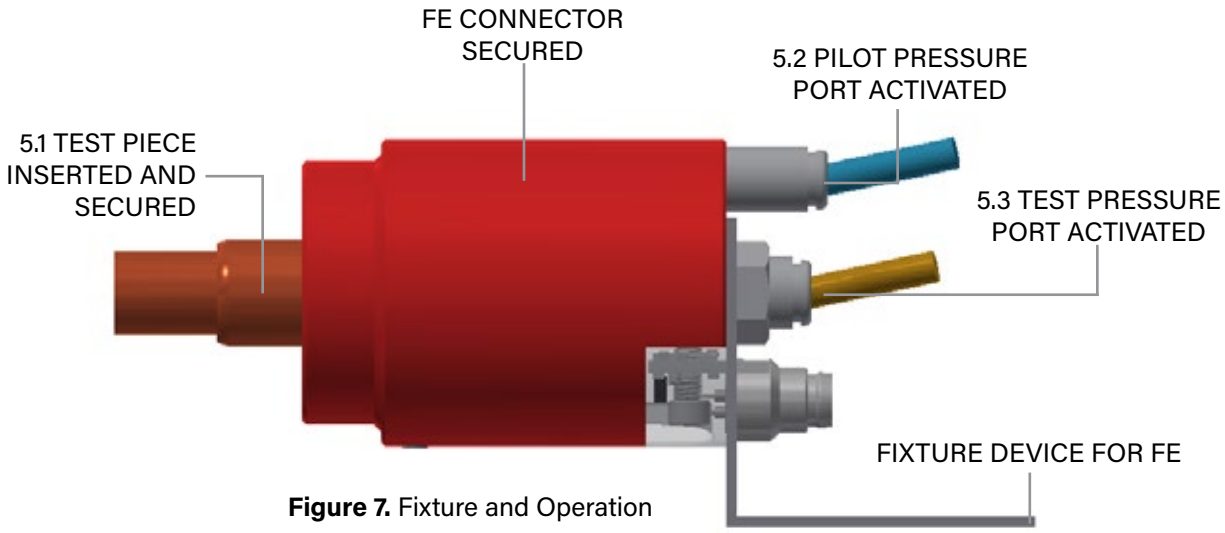


Figure 7. Fixture and Operation

MAINTENANCE AND CARE

A daily, weekly, and periodic inspection of the connector by a competent person is recommended. Lubricate connector at regular intervals. Petroleum jelly is recommended but care should be taken to verify the lubricant is compatible with the application. Users 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 CHART 2 on pg. 9 for seal sizes and part numbers.

6. Replacing Main Seal
7. Replacing Internal Seals
8. Replacing Internal Seals on an FE with ICON™

6. Replacing Main Seal

6.1. If replacing seals only, inspect washers for warping, corrosion, or excessive wear.

6.2. Replace complete FasTest main seal set if washers are warped, corroded or worn.

6.3. See the "Installation of Seals" section for detailed instructions.

7. Replacing Internal Seals

7.1. Loosen set screw (A) and remove seal casing (B) and main seal set (D).
Note: if repairing a connector with Sure Seal™, refer to step 8 on page 8

7.2. Remove piston (G). This may require a short blast of air pressure.

7.3. Use a small pick to remove the internal o-rings. See Figure 8.

7.4. Lubricate the new o-rings with petroleum jelly and re-install.

7.5. Re-install piston, main seal set, seal casing, and set screw.

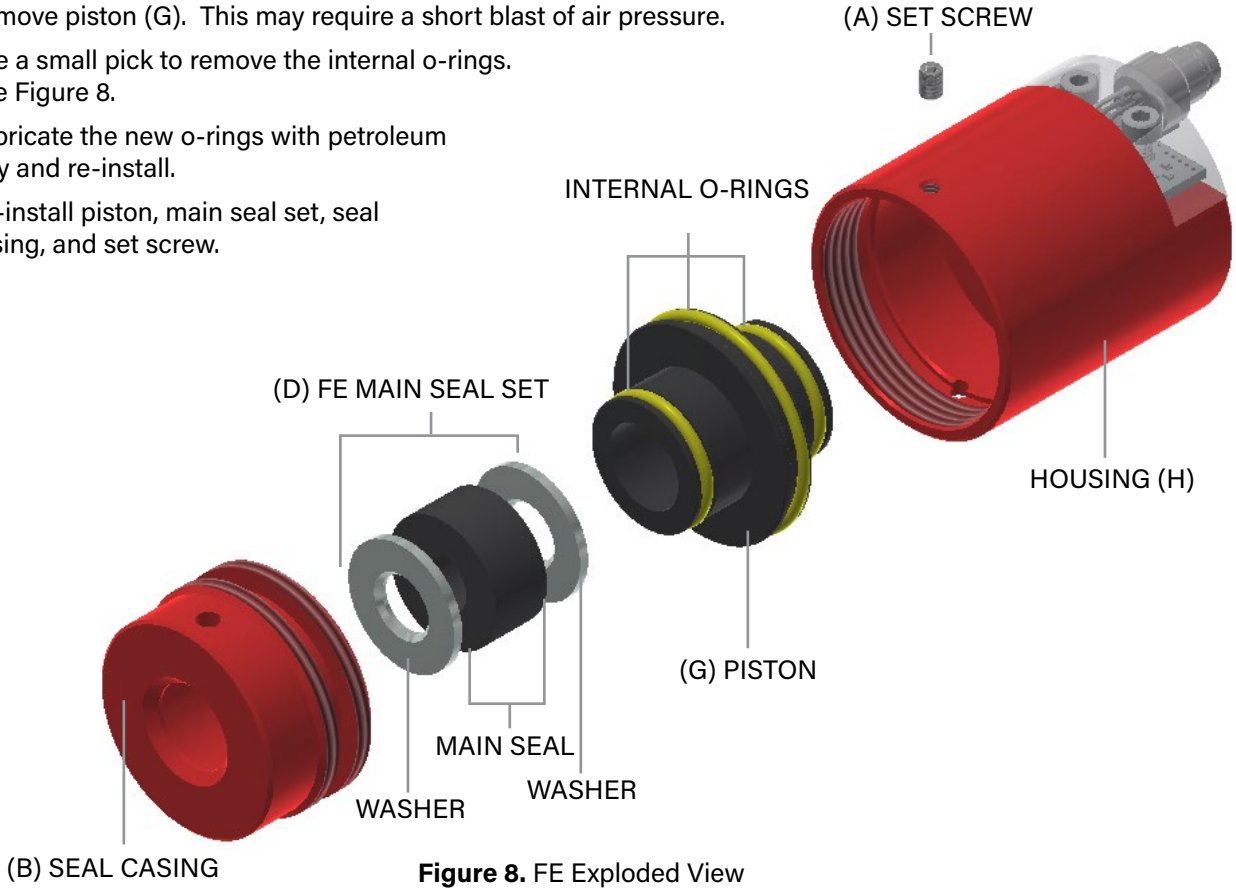


Figure 8. FE Exploded View

8. Replacing Internal Seals on a Connector with ICON™

8.1. Follow step 7.1

8.2. Take care when removing the piston because the actuator assembly and spring will come out. See Figure 9.

8.3. Replace the actuator assembly and spring as shown.

8.4. Follow steps 7.3 through 7.5.

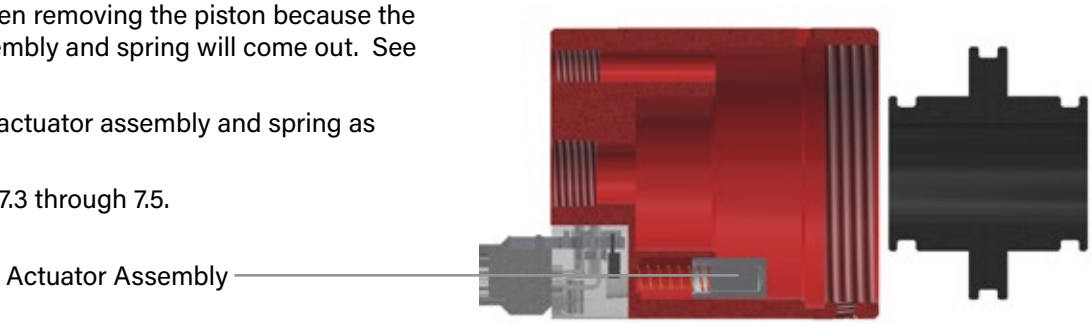


Figure 9. FE Section View

CHART 2: Connector Sealing Range

FE Body Sizes	FES Seal Set	Sealing Range	No. of Seals
FE001	FES0010050	.030 - .050	1
	FES001001	.050 - .080	1
	FES001002	.080 - .130	1
FE01	FES0101	.100 - .180	1
	FES0102	180 - .260	1
	FES0103	.260 - .340	1
	FES0104	.340 - .420	1
	FES0105	.420 - .510	1
	FES01-1/8NPT	1/8 NPT	1
FE1	FES115	.433 - .512	1
	FES116	.512 - .591	1
	FES117	.591 - .669	1
	FES118	.669 - .750	1
	FES119	.750 - .827	1
	FES1-1/4NPT	1/4 NPT	1
	FES1-3/8NPT	3/8 NPT	1
FE2	FES221	.787 - .866	2
	FES222	.866 - .945	2
	FES223	.945 - 1.204	2
	FES224	1.024 - 1.102	2
	FES225	1.102 - 1.181	2
	FES226	1.181 - 1.260	2
	FES227	1.260 - 1.339	2
	FES228	1.339 - 1.417	2
	FES229	1.417 - 1.510	2
	FES2-1/2NPT	1/2 NPT	1
	FES2-3/4NPT	3/4 NPT	1
	FE2S-1NPT	1 NPT	1

FE Body Sizes	FES Seal Set	Sealing Range	No. of Seals
FE3	FES3-31	1.496 - 1.614	3
	FES332	1.614 - 1.732	3
	FES333	1.732 - 1.850	3
	FES334	1.850 - 1.969	3
	FES3-1 1/2NPT	1-1/4 NPT	1
	FES3-1 1/2NPT	1-1/2 NPT	1
FE4	FES441	1.960 - 2.087	3
	FES442	2.087 - 2.205	3
	FES443	2.205 - 2.323	3
	FES444	2.323 - 2.441	3
	FES445	2.441 - 2.559	3
	FES446	2.559 - 2.677	3
	FES447	2.677 - 2.795	3
	FES448	2.795 - 2.913	3
	FES449	2.913 - 3.032	3
	FES4-2NPT	2 NPT	1
FE5	FES551	2.970 - 3.100	3
	FES552	3.100 - 3.230	3
	FES553	3.230 - 3.360	3
	FES554	3.360 - 3.490	3
	FES555	3.490 - 3.620	3
	FES556	3.620 - 3.750	3
	FES557	3.750 - 3.880	3
	FES558	3.880 - 4.010	3
	FES559	4.010 - 4.130	3
FE6	FES661	4.130 – 4.260	3
	FES662	4.260 – 4.390	3
	FES663	4.390 – 4.520	3
	FES664	4.520 – 4.650	3
	FES665	4.650 – 4.780	3
	FES666	4.780 – 4.810	3
	FES667	4.910 – 5.040	3

- Note: Standard main seal material is Neoprene. NPT seals are Urethane. NPT seal sets require pilot pressure booster. 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.

ICON OVERVIEW

The **FE Connector** comes in two versions: solid-state relay output (CV04SSR) and analog output (CV04ANA). Both allow monitoring of the actuator position to ensure a good seal and provide visual feedback to the operator.

Each time the connector is actuated; a piston slides forward and settles at a final position. To get consistent piston travel; pilot pressure, Device Under Test (DUT), connector placement, and main seal must be consistent. If one of those attributes changes, piston travel will change and the system can be set up to alert operators.

Solid State Relay (SSR) Output

The Sure Seal feature of **ICON** connectors compares the actuator piston with user-set limits to ensure a good seal. The user can set upper and lower travel limits so that low pilot pressure, out-of-tolerance DUT, seal wear, short connect, or other deviations from the nominal test setup can all be recognized. Alternatively, the user can set a single minimum-travel criterion, to check only that the piston has actuated as expected.

Additionally, a **Seal Life™** point can be set which overrides normal operation. When the piston actuates past the Seal Life™ point, the indicator light will turn red and the output will be disabled, signaling the user to replace the main seal.

The FE Connector retains stored limit(s) even when power is removed. Due to the fine sensor resolution and variation in seal height, calibration is recommended each time seals are replaced or the connector is re-built.

The **FE SSR** also features an indicator function which can be used to call attention to a connector that needs action. For example, it can be used to tell the technician which connector to use, or it can be used to indicate a test has already failed and a new part can be tested.

Color Indicators:

Blue Flash: the connector is on, but either not actuated or under-actuated

Solid Green: secure connection

Solid Yellow: over travel

Solid Red: Seal Life™

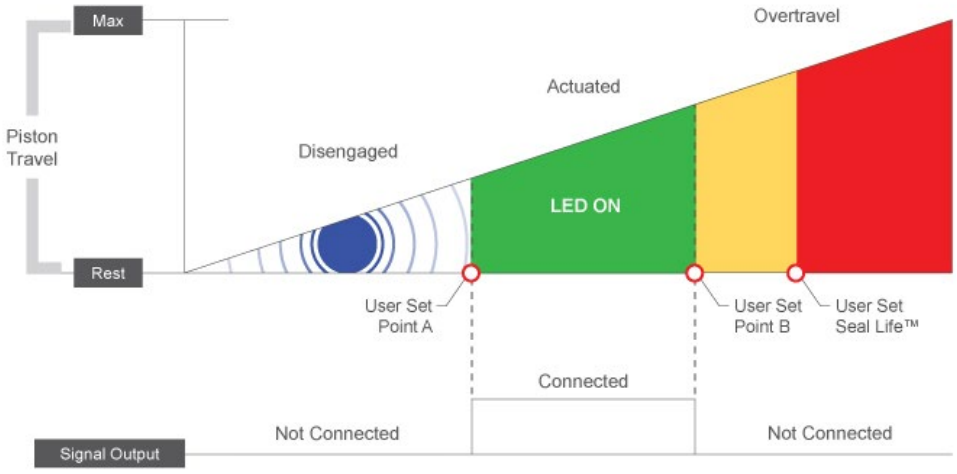


Figure 10. ICON™ and Seal Life™ Color Representation

Analog Output

The analog version of the FE+ allows the user to directly monitor the FE actuator position as an analog 0-10V signal. It also provides user-controlled red-and green LEDs, allowing user-defined R/Y/G indication to the operator. The CV04ANA is ideal for users that wish to use a high-capability PLC to implement advanced functionality.

ICON™ CALIBRATION - DISCRETE (SSR)

The connector has two calibration procedures, single point and dual point, that provide flexibility for different applications

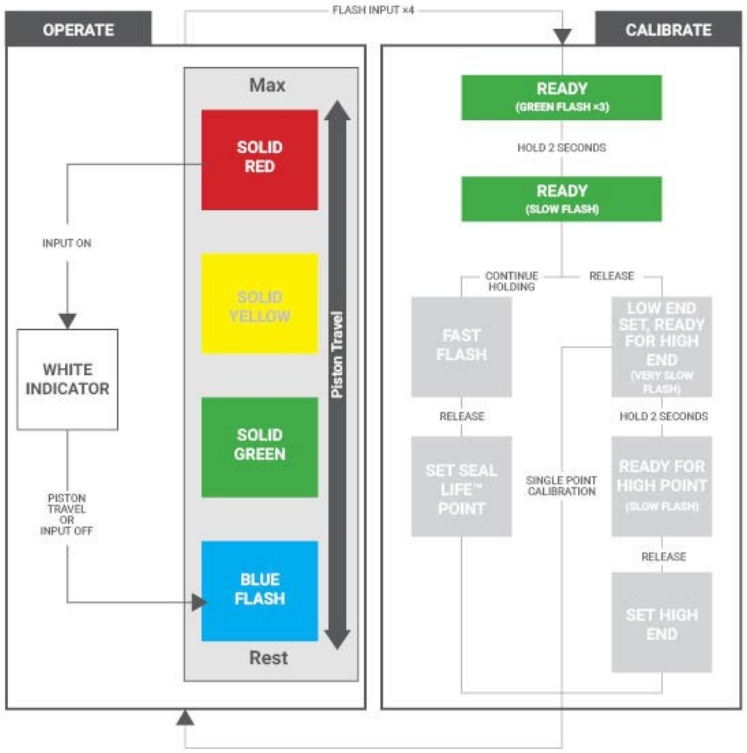


Figure 11. Calibration Flowchart

9.1. Calibration Process 1 – "Single Point Calibration"

Single Point calibration is optimized for quick calibration and users that only need to know the connector actuated to a certain point, e.g. bench-top leak testing. **Note: during calibration, the SSR output will mirror the LED indicator.**

9.1.1. Place calibration reference into the FE and apply pilot pressure.

9.1.2. Flash input 4 times quickly to enter programming mode. A quick triple green flash at regular intervals indicates the device is in calibration mode. **Note: Programming will time-out after about 30 seconds of inactivity. A short pulse on the input will restart this timer without setting a calibration point.**

9.1.3. Apply 24V until the connector begins to flash, about 2 seconds. The lower limit, Set Point A, will be set once the button is released.

9.1.4. Wait 30 seconds for calibration mode to time-out – Output signal will remain in the closed state.

9.1.5. Remove pilot pressure and calibration reference – Output signal will switch to open state.

9.1.6. Confirm proper operation.

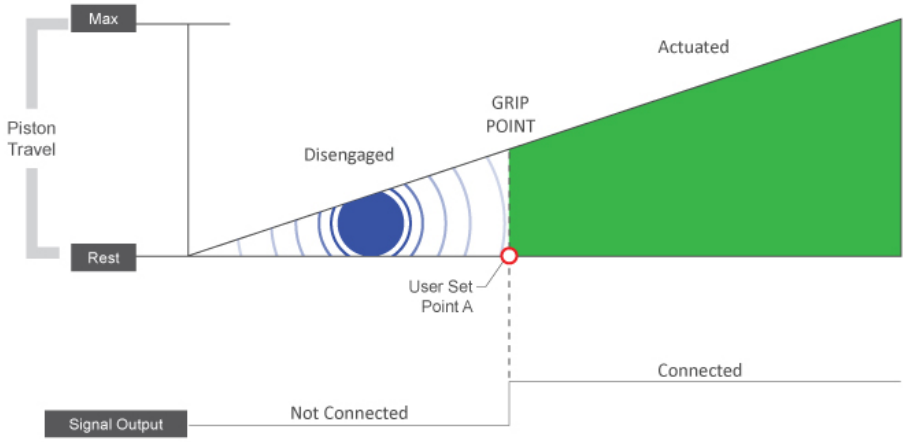


Figure 12. Single Point Calibration Graph

9.2 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: during calibration, the SSR output will mirror the LED indicator.**

9.2.1. Place a calibration reference, representing an oversized part (undertravel condition), into FE and apply pilot pressure.

9.2.2. Flash 24V signal on the input line 4 times quickly to enter programming mode. A quick triple green flash at regular intervals indicates the device is in calibration mode. **Note: If at any time the input is left low for more than 30 seconds, calibration mode will time-out. A short pulse on the input will restart this timer without setting a calibration point.**

9.2.3. Apply 24V to the input line until the connector begins to flash, about 2 seconds. The lower travel limit, Set Point A, will be set once the button is released. **Note: if the signal is held high for more than several seconds, the LED will begin strobing and the Seal Life™ point will be set instead.** Once the input is released, the LED will begin flashing slowly.

9.2.4. Remove pilot pressure and Calibration Reference.

9.2.5. Place a calibration reference, representing an undersized part (overtravel condition), into the FE. Apply pilot pressure.

9.2.6. Apply 24V to pin #2 for 2 seconds to set point B (Refer to Figure 13). The upper limit will be set once the button is released.

9.2.7. Remove pilot pressure and Calibration Reference.

9.2.8. Confirm proper operation.

9.2.9. As the seal wears, piston travel will increase even for a test piece of the same size. The calibration procedure can be repeated as often as necessary to account for this. To set a hard limit for piston travel, see the "Seal Life™" section.

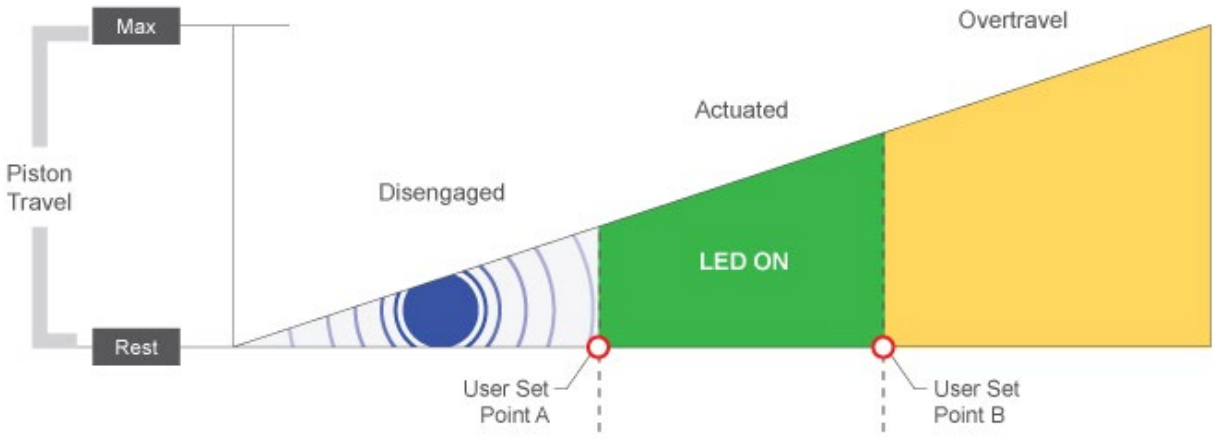


Figure 13. Dual Point Calibration Graph

SEAL LIFE™ CALIBRATION - DISCRETE (SSR)

10. **Seal Life™ Calibration**

Seal Life™ allows a secondary overtravel limit to be set. As the seal wears, the piston travel will increase even for a test piece of the same size. The Sure Seal™ calibration can be repeated as the seal wears to account for this. The Seal Life™ allows the user to set an upper limit on piston travel that cannot be overridden by Sure Seal™ recalibration, to indicate that the seal has reached the end of its useful life and must be replaced.

10.1. Use a calibration reference to actuate the piston to the desired Seal Life™ point. The calibration reference may be a severely undersized test reference, a machined stroke limiter, or other mechanisms.

10.2. Flash the input high 4 times in quick succession to enter programming mode. A quick triple green flash at regular intervals indicates the device is in calibration mode.

10.3. Hold the input line high. The indicator LED will start solid green. After about 2 seconds, the indicator will begin flashing green **but do not release the input.** Eventually, the indicator will begin strobing green rapidly.

10.4. At this point, the Seal Life™ point will be set when the input is released. The device will then return to normal operation.

10.5. To disable Seal Life™, perform steps 10.1 to 10.3 of the Seal Life™ calibration procedure.
Then, **without releasing the input**, remove the power supply to the device.

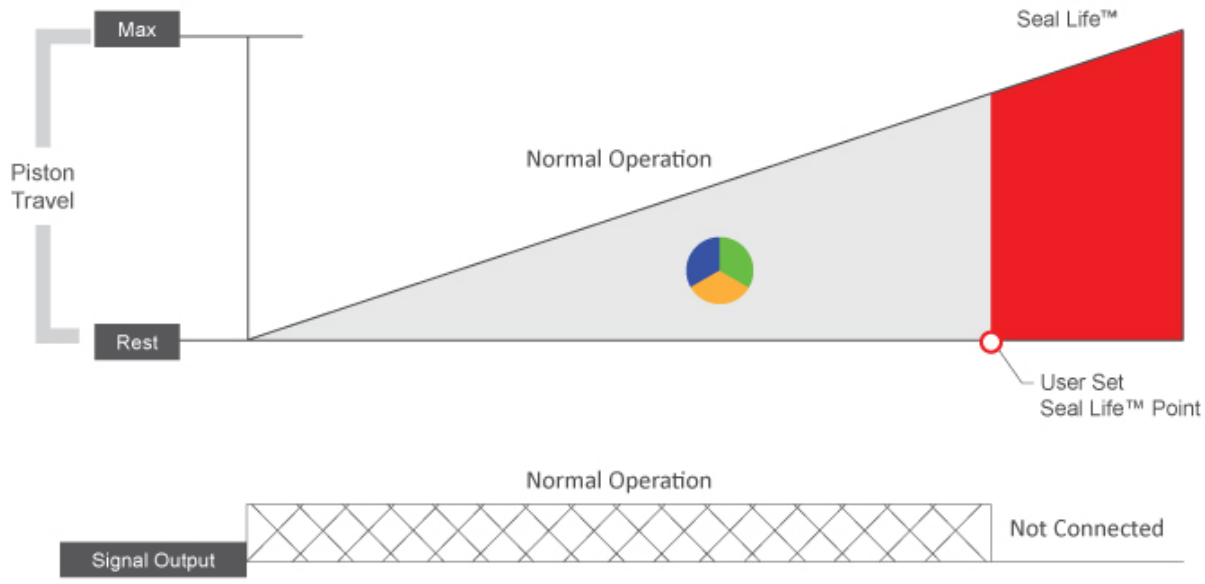
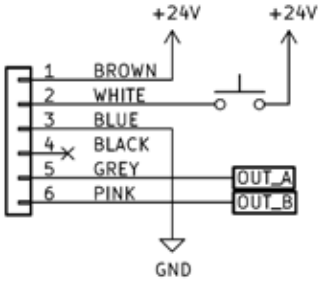
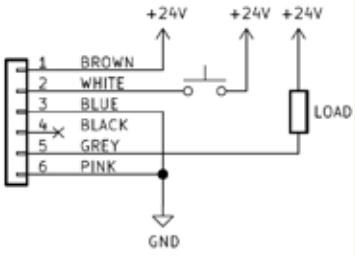
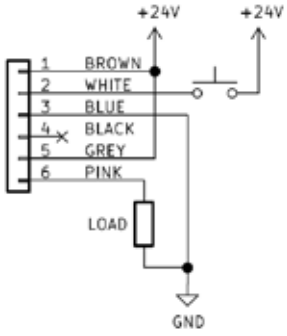
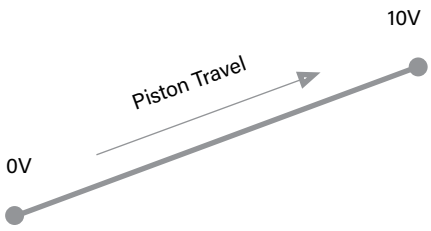
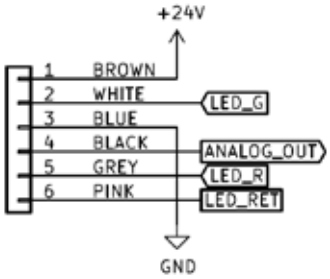


Figure 14. Seal Life™ Calibration Graph

ICON™ WIRING DIAGRAM

Operation	Output Specifications	Model Number	Timing Chart	Wiring Diagram
Solid State Relay	SSR	xxxCV04SSR	Connector Status: Connected / Not Connected	
	SSR as NPN			
	SSR as PNP			
Analog	ANA	xxxCV04ANA		

TROUBLESHOOTING

How does measuring piston travel correlate to verified connections?	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.
How do I know what calibration range to set?	It is application dependent and will require investigation by each specific user.
What impacts will the calibration range have on my test setup?	The 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.
Do I need to re-calibrate after changing seals?	For reliable performance, calibration should be performed after any substantial change to setup or process, including seal replacement.
Does the connector retain calibration points if it loses power?	Yes, the calibration points are stored on an internal memory.

For any other questions, contact: **fastsales@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.

ALL OTHER WARRANTIES EXPRESS OR IMPLIED, WHETHER ORAL, WRITTEN OR IN ANY OTHER FORM, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.

The sole and exclusive remedy under this warranty is limited to replacement of the product or an account credit in the amount of the original selling price, at the option of FasTest Inc. All allegedly defective products must be returned prepaid transportation to FasTest Inc., together with information describing the product's performance, unless disposition in the field is authorized in writing by FasTest Inc.