

ST50 MASS FLOW METER Installation and Operation Guide

Pre-Installation

The ST50 can be specified with integral or remote electronics. The flow element has a serial number etched into the side of the extension pipe as shown on Figure A. The transmitter circuit card has a serial number noted on the board as shown in Figure B. The flow sensor and transmitter circuit have been calibrated as a matched set and should be paired together in service unless otherwise approved by a factory technician.

Flow Direction Alignment

All sensor elements have a flow arrow indicator marked on the element assembly at the reference flat. These flow elements have been calibrated in a particular direction and are designed to be used in service with the flow arrow facing in the same direction as flow in the pipe stream. See Appendix C for orientation and factory calibration details.



Recommended Straight Run

To optimize flow meter system performance, FCI recommends installation with a minimum of 20 pipe diameters upstream straight run and 10 pipe diameters of downstream straight run. Where straight run limitations significantly reduce the available pipe diameters, FCI utilizes Vortab flow conditioners to produce a transferable flow profile from the calibration installation to actual field installations. FCI's proprietary AVAL software is available to make flow meter installation evaluations where straight run limitations are considered. See Figure C for recommended installation.





FCI flow meters may be installed with less than the recommended straight run, but may have performance limitations. FCI offers Vortab flow conditioners for use in applications that have significant straight run limitations. FCI uses the AVAL application modeling software to predict meter performance in each installation. AVAL outputs are available to review prior to order placement and will indicate performance expectations both with and without Vortab Flow Conditioning.

Specifications

Instrument

Media Compatibility: Air, compressed air, and nitrogen

Pipe/Line Size Compatibility: 23" to 24" [51 mm to 610 mm] **Range:** Air, compressed air, or nitrogen: 0.75 SFPS to 400 SFPS

[0.23 MPS to 122 MPS]

Accuracy: Standard: $\pm 2\%$ of reading, $\pm 0.5\%$ of full scale Optional: $\pm 1\%$ of reading, $\pm 0.5\%$ of full scale

Repeatability: ±0.5% of reading

Temperature Compensation:

Standard: 40 °F to 100 °F [4 °C to 38 °C] Optional: 0 °F to 250 °F [-18 °C to 121 °C]

Turndown Ratio: 3:1 to 100:1

Agency Approvals: 1

FM/CSA: Nonincendive for use in Class 1, Division 2, Groups A, B, C and D T4 Ta = 60 °C Indoor Hazardous (Classified) Locations. ATEX/IECEx: II 3 G EEx nA II T6; II 3 D T65°C (DC input power only) CPA, CE Mark, PED **Warranty:** One year

Flow Element (Standard or FPC Type)

Installation: Insertion, variable length with 1/2" or 3/4" NPT(M) compression fitting.

Type: Thermal dispersion

Material of Construction: 316 stainless steel body with Hastelloy C thermowell sensors, 316 stainless steel compression fitting with Teflon or stainless steel ferrule

Pressure (Maximum Operating without Damage):

Stainless steel ferrule: 500 psig [34 bar(g)] Teflon ferrule: 150 psig [10 bar(g)] Retractable packing gland: 500 psig [34 bar(g)]

Temperature (Maximum Operation):

Stainless steel ferrule: 0 °F to 250 °F [-18 °C to 121 °C] Teflon ferrule: 0 °F to 200 °F [-18 °C to 93 °C]

Process Connection: 1/2" MNPT or 3/4" MNPT with stainless steel or Teflon ferrule; retractable packing gland, 1/2"

or 3/4" MNPT with graphite or Teflon packing.

Insertion Length: Field adjustable lengths: 1" to 6" [25 mm to 152 mm]; 1" to 12" [25 mm to 305 mm]; or 1" to 18" [25 mm to 457 mm]

Flow Transmitter

Enclosure: NEMA 4X [IP67], aluminum, dual conduit ports with either 1/2" NPT or M20x1.5 entries. Epoxy coated.

Analog Output Signals: Dual 4-20 mA, configurable to flow rate and/or temperature (500 ohm max impedance) and a pulse output for total flow.

Output Pulse, Source: Totalized flow or alarm setpoint. 15 VDC. Pulse width at 50% duty cycle for rates 0 to 500 Hz, 0.5 second pulse width for pulse rates below 1 Hz. 25 mA maximum load pulsed, 10 mA maximum load if state set to normally on.

Output Pulse, Sink: Totalized flow or alarm setpoint. Pulse width at 50% duty cycle for rates 1 to 500 Hz, 0.5 second pulse width for rates below 1 Hz. Customer power source and load not to exceed 40 VDC and 150 mA.

Communication Port: RS232C, standard.

Input Power:

DC: 18 VDC to 36 VDC (6 W maximum) AC: 85 VAC to 265 VAC (12 W maximum, 1.6 A fuse) (CE Mark Approval from 100 VAC to 240 VAC)

Power Filter Board:

	Amp Code	Rated Current	Voltage Rating
Littelfuse TR5 Series 374 1160 0410	1160	1.60 A	250 V
Breaking Capacity	50A/250	VAC 50-60 H	lz cos φ = 1.0

Operating Temperature: For Indoor or Outdoor use,

0 °F to 140 °F [-18 °C to 60 °C]

Maximum Altitude: 12,000 ft. (3,658m)

Digital Display: ±9999 Counts LCD, 0.45" H [11.4 mm] characters, user scalable to flow rate units or as 0-100%. For applications in Div. 1 / Zone 1 environments and/or for dual-line digital display with built-in totalizer display, refer to FCI Model ST51.





Installing Flow Element

Compression Fitting Mounting



Caution: The element is shipped with a protective sleeve surrounding the flow element. After removing the sleeve, take care to prevent the element from sliding through the compression fitting and contacting the opposing wall with any force as it may cause damage to the element and potentially upset the calibration.

The ST50 is available with both Teflon compression fitting ferrules and metal ferrules. While the Teflon ferrule configuration can be readjusted, it is possible that over tightening may result in permanent positioning or damage to the extension pipe and will make future adjustment difficult. While Teflon provides for some adjustability, it has a lower process pressure rating and is not designed for continuous adjustments. The metal ferrule version can only be tightened down once and it becomes permanently positioned. The Ferrule type is indicated in the instrument part number displayed on the instrument tag. This can be cross referenced to the ordering information sheet.

All flow meters have been calibrated with the flow element located at the centerline of the pipe and flow stream as indicated in Figure D. Couplings and threadolets come in various dimensions. Proper installation requires that the element be measured with consideration to process connection dimensions and pipe centerline. FCI recommends that the element be first installed in the line with the compression fitting lightly tightened around the extension, then slowly move the pipe extension forward until the element is at centerline as shown.



Caution: On top mount installations, particularly, take care to prevent the element from sliding through the compression fitting and contacting the opposing wall with any force as it may cause damage to the element and potentially upset the calibration.

FLOW ELEMENT INSTALLATION & "U" LENGTH ADJUSTMENT



Figure D

Note: For proper performance install the element so that probe tip is .50 inches [13 mm] past pipe centerline. The instrument is specifically calibrated for centerline referenced installation, which is critical for line sizes 4" [25 mm] and smaller.

To assist in final installation, FCI suggests making a readable mark on the extension pipe to indicate the final desired compression fitting position that will place the element at the centerline reference once the system is tightened down into place. With the compression fitting lightly tightened, hold the element assembly along the outside of the installation, or directly above, to visually verify the compression fitting location will ensure centerline installation. To calculate the actual "U" length dimension, take the inside diameter of the pipe or duct divide by 2, then add 0.50", then add for the pipe wall thickness and the process fitting offset that allows the compression fitting to securely seat in the process port. See Figure D above.

Align the flat parallel to flow and adjust the instrument depth. Upon determination of the final compression fitting location on the extension pipe, apply the proper thread sealant to the NPT threads, firmly tighten the compression fitting into the mating process connection. Torque varies per application. Tighten the compression nut to the torque indicated with the corresponding ferrule material. Manufacturer recommends 1-1/4 turns from hand tight baseline.

Ferrule	Torque
Teflon	65 in – lbs
316 SST	65 ft – lbs

Retractable Packing Gland Mounting

A retractable packing gland, with ¹/₂" MNPT or ³/₄" MNPT threads and graphite or Teflon packing, is a process connection option. FCI single point flow meters are calibrated at the centerline of the process pipe. The flow element is properly mounted when the tip of the flow element is located .50 inches (13 mm) past the pipe centerline. Follow the below steps to install/retract instruments with the retractable packing gland option.

1. The scale etched on the side of the insertion probe indicates the length to the tip of the flow element. Calculate the insertion depth using the equation, variables, and Figure E below.



Figure E

- 2. Mark the insertion pipe at the calculated insertion depth.
- 3. **Ball Valve Applications Only**: If a ball valve is required, install the ball valve to the process mounting coupling. Close the ball valve to prevent the process media from leaking out when installing the packing gland with the process line pressurized.
- 4. Apply the proper thread sealant compatible with the process media to the male threads of the packing gland. Fully retract the insertion probe into the cavity of the packing gland and install the packing gland into the process mounting coupling or ball valve. **If a ball valve is not used, make sure to first depressurize the process line before installing**.

5. Tighten the packing nut until the internal packing is tight enough to prevent excess process leakage, but also allow the insertion probe to be inserted into place. For ball valve applications, open the ball valve after the packing nut has been tightened.



Caution: For applications where the process media is pressurized to greater than 232 psig [16 bar(g)] make sure to first depressurize the process line before making the insertion.

- 6. Align the orientation flat and flow arrow parallel to the flow direction and proceed to insert the flow element into the process media pipe up to the insertion depth mark.
- 7. Tighten the packing nut another ½ to 1 turn tight (approximately 20 ft-lbs) until the packing has created a full seal.
- 8. Ensure the locking collar is properly secured to the back of the packing gland. Torque the two No. 8-32 socket head cap screws on the locking collar to 20 in-lbs using a 9/64" hex key.

Retraction/Removal Procedure

1. Loosen the socket head cap screw on the side of the locking collar. See Figure F below.







- *Caution*: For applications where the process media is pressurized to greater than 232 psig [16 bar(g)] make sure to first depressurize the process line before retracting the flow element. At 232 psig [16 bar(g)], the effective force on the insertion probe is 45.5 lbs (20.6 kg), which is the limit at which the flow element can be safely guided by hand. When using hands to restrain the retraction, be prepared for a rapid pressure impulse of the flow element. Make sure that there are no objects directly behind the flow element as the insertion probe may retract very quickly.
- 2. Slowly loosen the packing nut until the insertion probe begins to retract. Use hands as needed to help control the retraction. If the probe does not begin to retract itself, gently shake and pull the insertion probe until the flow element has been fully retracted into the packing gland.
- 3. For ball valve applications, close the ball valve immediately after retraction to seal off the process. After closing the ball valve it is then safe to remove the flow element from the back end of the ball valve. **If a ball valve is not being used, make sure to first depressurize the process line before removing the flow element**.

Instrument Wiring

Before the instrument is opened to connect power and signal, FCI recommends that the following ESD precautions be observed:

Use a wrist band or heel strap with a 1 megohm resistor connected to ground. If the instrument is in the shop setting, there should be a static conductive mat on the work table or floor with a 1 megohm resistor connected to ground. Connect the instrument to ground. Apply antistatic agents such as Static Free made by Chemtronics (or equivalent) to hand tools to be used on the instrument. Keep high static producing items away from the instrument.

The above precautions are minimum requirements. The complete use of ESD precautions can be found in the U.S. Dept of Defense Handbook 263.



Warning: Only qualified personnel are to wire or test this instrument. The operator assumes all responsibility for safe practices while wiring and troubleshooting.

FCI recommends installing and input power disconnect switch and fuse near the instrument to interrupt power during installation and maintenance. Operator must have power disconnected before wiring.

Safety instructions for the use of the ST50 series (18 to 36 VDC version only) in Hazardous Areas. Approval, KEMA 06ATEX0207 X for Category 3 GD protection EEx nA T6 T65°. Special conditions for safe use:

1) Provision shall be made to prevent the rated voltage from being exceeded by transient disturbances of more than 40%.

2) For applications in explosive atmospheres caused by air/dust mixtures, cables and conduit entries shall be provided a degree of protection of at least IP65 according to EN60529.

Input Power

The ST50 is available with both VDC and VAC input power configurations. Customers selecting VDC input power will have a VDC input board only. Similarly, the VAC power board is supplied only with VAC powered units. In addition, both boards are marked for either DC or AC power. Only connect the power specified on the wiring module as shown in Figures G and H. Both VAC and VDC inputs require a Gnd wire to be connected. Input power terminal blocks accept 14-26 AWG wire.

Make sure power is OFF before wiring the instrument. Pull the power and signal output wires through the port, using care not to damage wires. FCI recommends using crimp lugs on the output wires to ensure proper connection with the terminal strip. Connect the output wires as shown in Figures G and H. Note that when the 4-20 mA outputs are used simultaneously, a single return lead is used.

(TR5, 250V 1.6A, SB, UL)

TR1

C00936-

VAC Power Connection

C88/CLI 0

SOURCE

COM

SINK

Figure H

Note: In sink mode, 40 VDC max, 150 mA max customer-

RS 232 Connection

PULSE

VAC Power

Pulse Out in sink mode

supplied power source.

As Shown:

AC Version

TB3

ANALOG OUT

VDC Power Connection



Figure G

VDC Power

As Shown:

18-36 VDC power connected with Gnd4-20 mA connected for flow and temperaturePulse Out in source mode

Note: In source mode, 15 VDC output max, 50 mA max.

Power Dissipation

DC Version

Power dissipation values under nominal conditions: Instrument (electronics + sensor): 4.5 watts Sensor only: 0.25 watts

Power dissipation values under maximum load conditions: Instrument (electronics + sensor): 6 watts Sensor only: 0.30 watts

Analog Output

<u>4-20 mA</u>: The instrument is provided with two 4-20 mA outputs. By default Output 1 is configured for flow and Output 2 is configured for temperature. Terminal blocks accept14-28 AWG wire, 500 ohms max load per output.

FC88/CLI 1.64 SB, UL C5 0 C4 0 SINK SOM RIN + 18-36VDC POWER I C00920-1 I OUT 2 RTN I OUT 1

VDC Input Power IO Board

Power dissipation values under nominal conditions: Instrument (electronics + sensor): 11.6 watts

Sensor only: 0.25 watts Power dissipation values under maximum load conditions:

85-265 VAC power connected with Gnd 4-20 mA connected for flow and temperature

Power dissipation values under maximum load conditions: Instrument (electronics + sensor): 12 watts Sensor only: 0.30 watts

VAC Input Power IO board



Modify the analog output configuration using one of the below listed methods:

- 1. The RS232 port, a PC/terminal program or FC88 hand held terminal and single letter commands as summarized in Appendix A, Table 5. Use the "V" menu to configure the instrument analog outputs.
- 2. The RS232 port, a computer and the CLI commands as summarized in Appendix A, Table 6.

Pulse Output Activation

The ST50 provides an optional pulse output feature. Instruments ordered with this feature and volumetric or mass flow units will be factory set with totalizer and pulse output activated. The mode can be changed in the field. As required for your application wire the sink or source output as shown in "Pulse Output Wiring" on the next page.

Source Mode:15 VDC output, 50 mA max.Sink Mode:40 VDC max, 150 mA max., customer supplied power source

Pulse Output Setup

The ST50 mass flow meter pulse output can be configured for either a pulse train (factory standard) for an external counter and/or flow rate indication or an alarm. The pulse output can be wired to use a source or sink outputs. The maximum frequency of the pulse output is 500 Hz. Set up the totalizer first, then configure the sink/source pulse output as required for the application (sink/source output, pulse factor, sample period and pulse state.

Source mode:	In this mode the flow meter electronics supplies the voltage and current for the pulse. Maximum 15 VDC and 50 mA (depends on the connected load).
Sink mode:	If the connected load requires >15 VDC and 50 mA an external power supply is required. Maximum 40 VDC and 150 mA.
Pulse factor:	Number of pulses per selected engineering unit. Default = 1 Example in NCMH: 1 = 1 pulse per NCM 0.1 = 1 pulse per 0.1 NCM (10 pulses per 1 NCM) 10 = 1 pulse per 10 NCM Range pulse factor 0.001 – 1000
Sample time:	Time in seconds before calculating the next number of pulses.
Pulse state:	Transitions High to Low or Low to High. Meaning the pulse is normally high or low.



Pulse output functions:

Alarm: can be set in Source and Sink mode. If this function is selected the state of the transistor driver changes from high to low or low to high, depending on the selected pulse state, at a set flow rate. (pulse factor and sample time not required).

Counter: can be set in Source and Sink mode. The transistor driver outputs the calculated number of pulses* based on the indicated flow. And external display will indicate the totalized flow.

Flow rate: can be set in Source and Sink mode. The transistor driver outputs the calculated number of pulses* based on the indicated flow. External display set to calculate flow from incoming pulses.

*Each sample period the number of pulses are calculated and output by the open collector. Any remaining fractional pulse in the calculation will be added to the next sample. Example:

flow = 90 NCMM (= 1.5 NCMS), Pulse factor =1, sample time is 1. after 1 second the number of calculated pulses is 1.5, pulse out is 1. Remainder = 0.5

after the next second the number of pulses is 2 (1.5+0.5), pulses out is 2. Remainder = 0

Pulse Output Wiring



Setup Interface

All parameters on this meter are set through the RS232 interface connection (modular jack P3). The RS232 interface allows the instrument to be set up with either an FC88 hand held communicator or a computer. The FC88 is powered through the meter and comes with the serial interface cable. If a computer interface is used, an adapter (RJ to 9-pin PC serial port) is required. The adapter can be obtained from FCI: Part No. 014108-02.

Using a serial comm/terminal program (e.g., HyperTerminal, TeraTerm, Putty, etc.) configure the PC's serial port (the one intended to be connected to the instrument) as listed below.

COM Port Number:	Number of COM port connected to instrument (COM1, COM2, etc.)
Baud Rate:	9600
Number of Bits:	8
Stop Bits:	1
Parity:	None
Flow Control:	None
Terminal Emulation:	VT100

After configuring the serial port (and making the PC-to-instrument connections) start a communications session with the applicable serial port. Enter any of the meter's single letter commands in the program's terminal window to execute a function. See "Table 5. ST50 List of Single Letter Commands" on page 25 (Appendix B) for the complete command list.

An additional command line interface (CLI) is available through the RS232 port. This interface is accessed with the "Y" command using a computer or FC88. The command line password is "357". See Table 6 in Appendix B for command line details.

Startup and Commissioning

- 1. Verify that all input power and output signal wiring is correct.
- 2. Apply power to the instrument. Observe that the instrument initializes in the normal operation mode with all outputs active and the display (if so equipped) showing flow with the factory-set flow unit. Allow 10 minutes for the instrument to warm up and come to thermal equilibrium.

The following FC88 commands are typical commands that are used during startup and commissioning:

Command	Name	Description	
Т	Normal Operation Mode	All outputs are active	
Z	Flow Unit Set-Up	Select Flow Units (5 English, 8 Metric), Pipe Dimensions	
W	Totalizer	Enable/Disable	
V	Output Configuration	Select a configuration: Pulse and/or Alarm, Pulse factor and/or setpoint, and source/sink polarity	
F	K-Factor (default=1)	Flow factor	
N	Warm Reset	Reinitialize C/B	
S	Totalizer Menu	Enables W menu (Option)	

An installed instrument indicates 0.000 with the process flow at zero. The flow engineering units are indicated on the instrument bezel. Additional units indicators are provided via self-adhesive labels if the instrument's flow units are changed in the future.

Flow Unit Modification

Example: <u>SCFM</u> Flow Units and <u>3 inch Sch 40</u> round pipe size set up:

Enter	Display	Description
Enter	menu: >	From Normal Operation Mode
Z	E for English M for Metric >	Flow Unit Set-Up menu
Е	0=SFPS, 1=SCFM, 2=SCFH, 3=LB/H,	English units
1	4=GPM # R round duct or S rectangular>	Select Standard Ft ₃ /Min (SCFM)
R	Dia.: 4.0260000 Change? (Y/N)>	Select Round Duct
Y	Enter value: #	
3.068	area: 7.3926572 CMinflow: 0.0000000 Change? (Y/N)>	3 inch Sch. 40 pipe I.D.
N	Maximum flow: 462.04 Enter to continue	
Y	Cmaxflow: 462.04 Change? (Y/N)>	
Y	#	
462.04	CMintemp (F): -40.00000 Change? (Y/N)>	
N	CMaxtemp (F): 250.00000 Change? (Y/N)>	
N	Percent of Range is: OFF Change to ON?>	
N	LCD Mult Factor x1 Change? (Y/N)>	
N	100.0 SCFM	Instrument will end up in Normal Operation Mode

RS232 / FC88

Menu Control and Organization

All user entries begin at the input mode prompt ">" except when the instrument is in the Main Function Mode. Most entries require at least two key strokes; a capital letter and the [ENTER] key, or one or more numbers and the [ENTER] key. If the unit is in the Main Function Mode just press the desired function letter to make an entry.

Backspaces are made using the backspace [BKSP] key. Some entries are case sensitive between numbers and letters. Be sure the SHIFT key is pressed to indicate the correct case. A square after the prompt caret indicates the FC88 is in lower case. A slightly raised rectangle in the same spot indicates the FC88 is in the upper case.

It is recommended that the FC88 be plugged into the instrument before power is applied. If the FC88 is plugged in while the instrument power is on and the FC88 does not respond, press [ENTER]. If there is still no response press [N] or cycle the power.



Note: The Zero and Span may be changed from the original calibration, provided the new values are within the original calibrated range; i.e., if the original calibration was 1 to 100 SCFM (4-20 mA), the new zero (4 mA) must be equal to or greater than 1 SCFM, the new span (20 mA) must be equal to or less than 100 SCFM.

Some entries require a Factory pass code. If this occurs contact FCI Field Service to continue programming the instrument. The instrument will prompt the user when this is necessary. Do not change any parameters that require this code unless there is an absolute understanding of the instrument's operation. The user cannot exit some routines unless all entries are completed or the power is cycled.



Note: Always press **"T"** before unplugging the FC88. If a frozen meter display is observed, reconnect the FC88 and wait 5 seconds for the meter to initialize. Disconnect the FC88 and confirm your meter display is varying.

The top level of the menu is shown in Table 5 in Appendix B. Enter the command letter mnemonic as listed in the tables below and in Appendix B to run a command. Exit a command at any time by entering "Q" [ENTER] in the menus D, K, V, W, or Z.

Table 1. Diagnostics and Factory Settings

- C Calibration Information Display only: A/D, Delta-R, Ref-R data values
 D Diagnostics
- Display only: List of unit parameters.
- K Factory Calibration Settings Display only: Cal. parameters; i.e., linearization and temperature compensation coefficients.
- **R** Factory Reset Replaces user data with factory calibration data.

Table 2. Z Menu – Units and Scaling Setup

	Units		
Select	E=English	M=Metric	
Select	0= SFPS	5 = SMPS	
or	1 = SCFM	6 = NCMH	
or	2 = SCFH	$7 = \mathbf{NCMM}$	
or	3 = LBS/H	8 = KG/H	
or	4 = GPM	9 = LPM	
		10 = SCMH	
		$11 = \mathbf{NMPS}$	
		$12 = \mathbf{SCMM}$	
	For Volumetric or	Mass Flow	
Select	R = Round pipe or d	luct	
or	S = Square duct		
Set	Diameter or Wide x	High (in inches or mm)	
Set	CMaxflow = Maxim	um flow rate (span)	
Set	CMinflow = Minim	um flow rate (zero)	
Note: Changing units requires rescaling the unit (set new zero and span).			

Table 3. V Menu – Output Configuration Setup

Select 4-20 mA Output Configuration	Select \rightarrow	1 4-20 mA Output #1 = Flow 4-20 mA Output #2 = Temp	2 4-20 mA Output #1 = Flow 4-20 mA Output #2 = Flow		3 4-20 mA Output #1 = Temp 4-20 mA Output #2 = Flow		4 4-20 mA Output #1 = Temp 4-20 mA Output #2 = Temp
Select NAMUR Mode	Select NAMUR ModeSelect \rightarrow 1 NAMUR: OFF2 NAMUR: Low					3 NAMUR: High	
Ochot	Select \rightarrow	1 Source = Pulse Sink = Pulse	S	2 ource = Pulse Sink = Alarm1	3 Source = Alar Sink = Pulse	m0	4 Source = Alarm0 Sink = Alarm1
Select Source/Sink	Set \rightarrow	PFactor	PFactor		PFactor		Switchpoint0
(Pulse) Output	Set \rightarrow	Sample Period	Sample Period		Sample Period		Source state
Configuration	Set \rightarrow	Source state	Source state		Switchpoint0		Switchpoint1
	Set \rightarrow	Sink state	Switchpoint1 Sink state		Source state		Sink state
	Set →	n/a			Sink state		n/a

"V" Menu Output Configuration Setup

Use the V menu to set up the 4-20 mA analog outputs (including NAMUR configuration) and source/sink (pulse) outputs.



Note: The display comes up to the last setting saved and stays for 2 seconds. If **N** or [ENTER] is entered, the menu proceeds to the Pulse out. If **Y** is entered, the display moves to the selection options and/or asks for confirmation. If you miss the option, select [Enter] repeatedly to loop around

Analog Out	iss the option, select [Enter]	NAMUR Mode Select	ed	Source:	Alarm0
Output Mode Se	lected	NAMUR: Off		Sink:	Pulse Enter 3 to make
4-20 mA #1:	Flow	Change? (Y/N)>			the selection #
4-20 mA #2:	Temp	NAMUR: Of	F	Source: Sink:	Alarm0 Alarm1
Change? (Y/N)>		En	ter 1 to make		Enter 4 to make
4-20 mA #1	1: Flow	NAMUR: Lo	w		the selection #
4-20 mA #2	2: Temp Enter 1 to make	En	ter 2 to make	PFactor: 1.000	
	the selection	NAMUR: Hig	jh	if yes	
4-20 mA #1 4-20 mA #2	1: Flow 2: Flow	En	ter 3 to make e selection #	Enter new Sample Period: 1	factor: second
	Enter 2 to make	Dulas Out		Change? (Y/N)>
4-20 mA #1	1: Temp	Pulse Out Pulse Out Selected		Enter new	Sample Period:
4-20 mA #2	2: Flow Enter 3 to make	Source: Pulse		lf alarm is a selec	ted output
	the selection	Sink: Pulse		Set point1: 000	Set points are in the
4-20 mA #1 4-20 mA #2	1: Temp 2: Temp	Change? (Y/N)>			same units as the flow or temp.
	Enter 4 to make	Source: Pu	lse	Change? (Y/N)>	
	the selection	En	ter 1 to make	Enter new	set point:
		the Source: Pu	selection #	Resume normal o	operation
		Sink: Ala	arm1	Source state:	
		En	ter 2 to make e selection #	High to Low	
				Change to Low to	High?>
Example: Co	UMMAND V (Referen	ce lable 3)			4
Case: 4-20 mA	#1 = Flow, 4-20 mA #2 = 1	emperature, NAMUR =	Low, Source Out =	Pulse, Sink = Alarm	1
Pressing [V][E	NTER] will display	"Output Mode Sele	eted" :		
The la	ist saved mode of the next m	ienu item displays:	•		
"4-20	mA #I = Flow''	"4-20 mA $\#2 = Ten$	ap"tollow	ved by the prompt:	
"Chai	nge?(Y/N)"				
Press	[ENTER] (no change).				
The la	ist saved mode of the next n	nenu item displays:			
"NAN	IUR: Off"		follow	ved by the prompt:	
"Chai	nge?(Y/N)''	Select Y [Enter].	The dis	play reads,	
"NAN	1UR:Off"		follow	ved by the prompt:	
"Ente	er 1 to make the selection #	" Select[ENTER]	Bypassi	ing "1" the next display	y reads,
"NAN	IUR:Low"		follow	ved by the prompt:	
"Ente	er 2 to make the selection #	" Select 2 and [ENTE	R] "2" sets	the new NAMUR con	figuration.
The la	ist saved mode of the next n	tenu item displays:	6 11		
"Sour	ce: Pulse"	"Sink: Pulse"	tollow	ved by the prompt:	
"Cha	nge?(Y/N)"	Select Y [Enter].	The dis	play reads,	
"Sour	ce: Pulse"	"Sink: Pulse"	follow	ved by the prompt:	
"Ente	er 1 to make the selection #	" Select[ENTER].	Bypassi	ing "1" the next display	y reads,
"Sour	ce: Pulse"	"Sink: Alarm1"	follow	ved by the prompt:	
"Ente	er 2 to make the selection #	" Select 2 and [ENTE	KJ. "2" sets	s the new source/sink of	configuration.
The la	ist saved mode of the next n	nenu item displays:			
"PFac	ctor: 1.000"		follow	ved by the prompt:	
"Cha	nge?(Y/N)>"		Respond	d with "Y" to enter a fac	tor anywhere from 0.001
			to 1000. of flow.	If no change, select N a	and/or [ENTER] to

continue.

	The last saved mode of the next me	enu item displays:	
	"Sample Period"		followed by the prompt:
	"Change?(Y/N)>"		Respond with "Y" to enter a sample period value from 0.5 to 5 seconds.
If no	change, select N and/or [ENTER] to co	ontinue.	
	The last saved mode of the next me	nu item displays:	
	"Source state: "	"High to Low"	followed by the prompt:
	Change to "Low to High?>"		Respond with "Y" to toggle to the alternate setting.
If no	change, select N and/or [ENTER] to co	ontinue.	
	The last saved mode of the next me	nu item displays:	
	"Switchpt1"	"0.0000000"	followed by the prompt:
	"Change?(Y/N)>"		Respond with "Y" to enter a setpoint value (value is in same units as the flow and must be within the calibrated range).
If no	change, select N and/or [ENTER] to co	ontinue.	
	The last saved mode of the next me	nu item displays:	
	"Sink state: "	"High to Low"	followed by the prompt:
	"Change to "Low to High?>"		Respond with "Y" to toggle to the alternate setting.
If no	change, select N and/or [ENTER] to co	ntinue to normal operation (pr	rogramming finished).

Maintenance

The FCI instrument requires little maintenance. There are no moving parts or mechanical parts subject to wear in the instrument. The sensor assembly which is exposed to the process media is composed of 316 SS and Hastelloy C.

Without detailed knowledge of the environmental parameters of the application surroundings and process media, FCI cannot make specific recommendations for periodic inspection, cleaning, or testing procedures. However, some suggested general guidelines for maintenance steps are offered below. Use operating experience to establish the frequency of each type of maintenance.

Calibration

Periodically verify the calibration of the output and recalibrate if necessary. FCI recommends every 18 months at a minimum.

Electrical Connections

Periodically inspect cable connections on terminal strips and terminal blocks. Verify that terminal connections are tight and physically sound with no sign of corrosion.

Remote Enclosure

Verify that the moisture barriers and seals protecting the electronics in the local enclosure is adequate and that no moisture is entering the enclosure.

Electrical Wiring

FCI recommends occasional inspection of the system's interconnecting cable, power wiring and flow element wiring on a "common sense" basis related to the application environment. Periodically the conductors should be inspected for corrosion and the cable insulation checked for signs of deterioration.

Flow Element Connections

Verify that all seals are performing properly and that there is no leakage of the process media. Check for deterioration of the gaskets and environmental seals used.

Insertion Type Flow Element Assembly

Periodically remove the flow element for inspection based on historical evidence of debris, foreign matter, or scale build-up and appropriate plant shutdown schedules and procedures. Check for corrosion, stress cracking, and/or build-up of oxides, salts, or foreign substances. The thermowells must be free of excessive contaminants and be physically intact. Any debris or residue build-up could cause inaccurate flow indication. Clean the flow element, as necessary, with a soft brush and available solvents (compatible with stainless steel).

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Troubleshooting

Application Verification

After verifying that the flow meter is functioning, review the application parameters as shown below to verify the calibration matches the process media.

Equipment Needed

Flow Instrument Calibration Data Process Parameters and Limits

Check Serial Numbers

Verify that the serial number of the flow element and the flow transmitter electronics are the same. The flow element and the flow transmitter are a matched set and cannot be operated independently of each other.

Check the Instrument Installation

Verify correct mechanical and electrical installation. Verify the flow element is mounted at least 20 diameters downstream and 10 diameters upstream from any bends or interference in the process pipe or duct.

Check for Moisture

Check for moisture on the flow transmitter. Moisture may cause intermittent operation. Check for moisture on the flow element. If a component of the process media is near its saturation temperature it may condense on the flow element. Place the flow element where the process media is well above the saturation temperature of any of the process gases.

Check Application Design Requirements

Application design problems may occur with first time application instruments, although the design should also be checked on instruments that have been in operation for some time. If the application design does not match field conditions, errors occur.

- 1. Review the application design with plant operation personnel and plant engineers.
- 2. Ensure that plant equipment such as pressure and temperature instruments conform to the actual conditions.
- 3. Verify operating temperature, operating pressure, line size, and gas medium.

Verify Standard Versus Actual Process Conditions

The flowmeter measures the mass flow rate. The mass flow rate is the mass of the gas flowing through a pipe per time. Other flow meters, such as an orifice plate or a pitot tube, measure the volumetric flow rate. The volumetric flow rate is the volume of gas per time. If the readings displayed do not agree with another instrument, some calculations may be necessary before comparing them. To calculate the mass flow rate, the volumetric flow rate, and the pressure and temperature, the point of measurement must be known. Use the following equation to calculate the mass flow rate (Standard Volumetric Flow rate) for the other instrument:

Equation:

$$\begin{array}{l} Q_{s} = Q_{A} \times \frac{P_{A}}{T_{A}} \times \frac{T_{s}}{P_{s}} \\ Q_{A} = & \text{Volumetric Flow} \\ P_{A} = & \text{Actual Pressure} \\ P_{s} = & \text{Standard Pressure} \\ P_{s} = & \text$$

Example:

 Q_{A} = 1212.7 ACFM P_{A} = 19.7 PSIA P_{a} = 14.7 PSIA

 ACFM
 $Q_s = 1485 \text{ SCFM}$

 A
 $T_A = 120^\circ F (580^\circ R)$

 A
 $T_s = 70^\circ F (530^\circ R)$

(Metric: $P_s = 1.01325$ bar(a) $T_s = 21.1^{\circ}C$ (294.1K))



Calibration Parameters Verification

The instrument uses a set of predetermined calibration parameters to process flow signals. Most of these parameters should not change. Included with the instrument is a data package containing the *ST50 Delta R Data Sheet*. This contains the calibration parameters stored in the flow transmitter at the factory. To verify that these parameters have not changed, complete the following:

- 1. Identify the appropriate Delta R data sheets by serial number of the instrument.
- 2. Press [D] [ENTER] to examine each of the parameters. The [ENTER] key allows scrolling one message at a time. Use Table 4 to verify parameters with the Delta R data sheet ST50 Parameters.

S/W Version:	dR Max:	T SpanIDAC 1:	
Flow Factor:	Cal Ref:	T ZeroIDAC 1:	
Cmin Flow:	Teslp:	State 0:	
Cmax Flow:	Teslp 0:	Switch Pt 0:	
Eng Units:	Teslp 2:	State 1:	
Line Size 0:	Tot Menu:	Switch Pt 1:	
Line Size 1:	Tot Flag:	K factor 1:	
Cmin Temp:	Totalizer:	K factor 2:	
Cmax Temp:	Rollover Cnt:	K factor 3:	
Min Flow:	Fix Pt Flag:	K factor 4:	
Max Flow:	Pulse Factor:	I factor:	
Density:	Pulse Out:	Temp Flag:	
*C1 [1]:	Hours:	Out Mode:	
*C1 [2]:	Sample Period:	Namurmode:	
*C1 [3]:	dR Slope :	Boxcar Max:	
*C1 [4]:	dR Off Set :	RTD-SLP-385:	
*C1 [5]:	Refr Slope:	% of Range:	
Break Pt:	Refr Off Set:	User Name:	
*C2 [1]:	SpanIDAC 0:	Shop Order #:	
*C2 [2]:	ZeroIDAC 0:	Serial No.:	
*C2 [3]:	SpanIDAC 1:	Mode l#:	
*C2 [4]:	ZeroIDAC 1:	LCD Multiplier	
*C2 [5]:	T SpanIDAC 0:		
dR Min:	T ZeroIDAC 0:		

Table 4. Diagnostic Test Sequence on Display

An issue may exist if parameters within asterisk (*) have changed. Consult with Customer Service if this is the case. If the parameters have not changed, continue with the next section.

Hardware Verification

Equipment Required:

- Digital Multimeter
- Screwdriver

The ST50 flow meter is made up of these basic components:

- Sensor element
- Customer interface circuit board
- Control circuit assembly circuit board module
- Electronics enclosure

Step 1

Verify fuse (F1) located on the customer interface circuit board is in normal working condition.

Remove power from the instrument. Open the electronics enclosure exposing the customer interface circuit board. This circuit board is located under the shorter enclosure lid along with all of the power and input/output connections. Unscrew the clear cover on the fuse and pull the fuse out of the fuse holder. Check the fuse for continuity. If fuse reads open, replace with equivalent component (FCI part no. 019933-01), Wickmann Inc. series 374, 1.6 A (amp code 1160), package 0410 (short radial leads).



<u>Step 2</u>

Verify interconnecting cable from the customer interface board and the control circuit board assembly module are correctly seated into the appropriate header.

Remove power from the instrument. Open the electronics enclosure exposing the customer interface circuit board. This circuit board is located under the shorter enclosure lid along with all of the power and input/output connections. Remove the 2 screws securing the interface circuit board to the electronics enclosure. Carefully lift the interface face board exposing the interconnecting cable between the interface board and the control circuit assembly. Verify cable is seated firmly at both ends of the cable header.



<u>Step 3</u>

Verify sensor element continuity and resistance.

Remove sensor element cable from the bottom of the control circuit assembly. Note that two of the wires have a red stripe and are located closest to the interconnecting cable header. Using an ohmmeter verify that resistance between the two red striped wires is approximately 1100 ohms \pm 20. This resistance is temperature dependant. The resistance at 70 degrees F should be 1082 ohms. Verify the resistance between the two natural colored wires are approximately the same.



- Sensor Element Cable

Transmitter Circuit Calibration Check (Delta R Verification)

References

• Delta R data sheet

Equipment

- FC88 Communicator or equivalent.
- DMV
- Delta R data sheet Match by serial numbers
- 2 ea. precision decade resistance boxes, 0.1% (Largest steps: 1k ohm, smallest steps 0.01 ohms)
- 250-ohm axial lead precision resistor, 0.1% or better, 1 W
- Small flat blade screwdriver, 3/32 inches wide blade
- FCI normalization cable, FCI part number 006407

Procedure

- 1. Verify all "D" mode calibration parameters are correct according to the meter's Delta R data sheet, before starting verification.
- 2. Turn power OFF.
- 3. Mark all sensor element wires connected to the circuit board for easy reconnection to the proper terminals. Disconnect the wires. Note the orientation of the sensor element plug connected to the circuit board. Unplug the connector from the board.
- 4. Connect the resistance decade box to the electronics as per the appropriate diagram for the ST50. Connect the 250-ohm resistor across the 4-20 mA output terminals.



Note: Interconnecting wiring (resistance decade box to electronics) must be same gauge and length (suggested: 24 AWG and 45") to avoid any inaccuracies in the Delta R verification caused by unequal wire lengths and/or wire gauges. Use of the FCI normalization cable avoids this issue.

- 5. Set both decade boxes for the nominal resistance value (1000 ohms) $\pm 0.01\%$
- 6. Connect DVM to the meters output termination and monitor the meter output.
- 7. Turn power ON and allow the instrument 5 minutes to stabilize.
- 8. With the FC88 connected, press [T] [Enter] to view the Normal Operating Mode.
- 9. Adjust the Active decade box (Reference decade box remains fixed @ 1000 ohms) to achieve the appropriate Delta R for the displayed flow value and output, noted on the meter's Delta R data sheet.
- 10. Note the [C] mode and verify the meters displayed TCDR and REFR values corresponding to the displayed flow rate as per the meter's Delta R data sheet.
- 11. Return to Normal Mode operation ([T] menu).



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Appendix A - Approval Information

EU
Information



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Appendix B - List Commands

COMMAND MNEMONIC	COMMAND FUNCTION	COMMAND DECRIPTION
А	R	AvgDelta_r, AvgRef
В	R	Delta_r, Ref_r
С	R	Tcdelta_r, Ref_r
D	R	Diagnostics
F	R/W	Kfactors
G	R/W	Clear FlashEE, Boxcar Count, ADC to Ohms Cal
K	R/W	Cal Parameters
L	R/W	Output Cal
Ν	W	Warm Restart
R	W	Factory Restore
S	R/W	Totalizer Menu On/Off
Т	R	Normal Mode
V	R/W	Output Config
W	R/W	Totalizer
Y	W	Command Line Interface
Z	W	Flow units, Pipe Size, and LCD Scaling

Table 5. ST50 List of Single Letter Commands

Table 6. ST50 List of CLI Commands

COMMAND MNEMONIC	COMMAND FUNCTION	COMMAND DESCRIPTION	DATA TYPE
BK	R/W	Break Point	Float
BM	R/W	Boxcar Filter Max	Integer
CM	R/W	Cminflow	Float
CR	R/W	Calibration Ref	Float
CX	R/W	Cmaxflow	Float
C1[1-5]	R/W	Coefficients set1	Float
C2[1-5]	R/W	Coefficients set2	Float
DI	R	Diagnostics	Null
DM	R/W	DeltaR Minimum	Float
DN	R/W	Density	Float
DR	R	Delta R	Float
DX	R/W	DeltaR Maximum	Float
DS	R/W	DeltaR Slope	Float
DF	R/W	DeltaR Offset	Float
EU	R/W	Engineering Units	Integer
FF	R/W	Flow Factor	Float
FP	R/W	Fix Point Flag	Integer
FO	R/W	Pulse Out State0	Integer
F1	R/W	Pulse Out State1	Integer
HR	R/W	Tot Dump Hours Cntr	Integer
IF	R/W	I Factor	Float

COMMAND MNEMONIC	COMMAND FUNCTION	COMMAND DESCRIPTION	ДАТА ТҮРЕ
K[1-4]	R/W	K Factors	Float
LO	R/W	Line Size0	Float
L1	R/W	Line Size1	Float
MN	R/W	Minflow	Float
MX	R/W	Maxflow	Float
NN	R/W	Namur Mode	Integer
OM	R/W	Outmode	Integer
PF	R/W	Pulse Factor	Float
PL	R/W	Pulse Out	Integer
PS	R/W	Pulse Sample Period	Float
PW	R/W	Pulse Width	Float
P0	R/W	Switch Point0	Integer
P1	R/W	Switch Point1	Integer
RO	R/W	RollOver Cntr	Long
RR	R	Reference R	Float
RS	R/W	RefR Slope	Float
RF	R/W	RefR Offset	Float
SF	R	SFPS Flow	Float
SN	R/W	Serial Number	String (16 chars max)
SO	R/W	Shop Order Number	String (16 chars max)
S 0	R/W	SpanDAC0 for 4-20mA #1	Integer
83	R/W	SpanDAC1 for 4-20mA #2	Integer
S2	W	Save FACTORY	N/A
ТС	R	TCdeltar	Float
TD	R/W	Teslp	Float
TF	R/W	Totalizer OFF/ON Flag	Integer
ТМ	R/W	Cmintemp	Float
TP	R/W	Totalizer Temperature Flag	Integer
TT	R/W	Totalizer Value	Float
TX	R/W	Cmaxtemp	Float
TZ	R	Temperature	Float
ТО	R/W	Tcslp0	Float
T2	R/W	Tcslp2	Float
T3	R/W	TSpanDAC0 for 4-20mA #1	Integer
Τ7	R/W	TSpanDAC1 for 4-20mA #2	Integer
T5	R/W	TZeroDAC0 for 4-20mA #1	Integer
Τ8	R/W	TZeroDAC1 for 4-20mA #2	Integer
UF	R	User Flow	Float
UK	R	User FlowK	Float
UN	R/W	User Name	String (16 chars max)
VN	R	Version Number	String (16 chars max)
XX	R/W	Test Flow Rate (SFPS)	Float
XY	W	Delete Test Flow Rate	Float
ZO	R/W	ZeroDAC0 for 4-20mA #1	Integer
Z2	R/W	ZeroDAC1 for 4-20mA #2	Integer

Table 6. ST50 List of CLI Commands, Cont.

Command Line Password: 357

RBK<CR>

 $\langle CR \rangle$



Note: When invoking a Write Function, separate the Command characters and the data value with a space. All Read and Write Functions are completed with a <CR>. To exit CLI, press <CR> following the last Command <CR>.

Examples:

(Read Breakpoint) WBK 2222<CR> (Write Breakpoint 2222) RC11<CR> (Read Coefficient C1,1) WC11 -234.567<CR> (Write Coefficient C1,1, -234.567) (Leave Command Line Mode)

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Appendix C - Drawings







Appendix D - Customer Service

Customer Service/ Technical Support FCI provides full in-house technical support. Additional technical representation is also provided by FCI field representatives. Before contacting a field or in-house representative, perform the troubleshooting techniques outlined in this document.

By Mail

Fluid Components International LLC 1755 La Costa Meadows Dr. San Marcos, CA 92078-5115 USA Attn: Customer Service Department

By Phone

Contact the area FCI regional representative. If a field representative is unable to be contacted or if a situation is unable to be resolved, contact the FCI Customer Service Department toll free at 1 (800) 854-1993.

By Fax

To describe problems in a graphical or pictorial manner, send a fax including a phone or fax number to the regional representative. Again, FCI is available by facsimile if all possibilities have been exhausted with the authorized factory representative. Our fax number is 1 (760) 736-6250; it is available 7 days a week, 24 hours a day.

By Email

FCI Customer Service can be contacted by email at: techsupport@fluidcomponents.com. Describe the problem in detail making sure a telephone number and best time to be contacted is stated in the email.

International Support

For product information or product support outside the contiguous United States, Alaska, or Hawaii, contact your country's FCI International Representative or the one nearest to you.

After Hours Support

For product information visit the FCI website at www.fluidcomponents.com. For product support call 1 (800) 854-1993 and follow the prerecorded instructions.

Point of Contact

The point of contact for service, or return of equipment to FCI is your authorized FCI sales/service office. To locate the office nearest you, visit the FCI website at www.fluidcomponents.com.

Warranty Repairs or Returns

FCI prepays ground transportation charges for return of freight to the customer's door. FCI reserves the right to return equipment by the carrier of our choice.

International freight, handling charges, duty/entry fees for return of equipment are paid by the customer.

Non-Warranty Repairs or Returns

FCI returns repaired equipment to the customer either collect or prepaid and adds freight charges to the customer invoice.

Return to Stock Equipment

The customer is responsible for all shipping and freight charges for equipment that is returned to FCI stock from the customer site. These items will not be credited to customer's account until either all freight charges are cleared or until the customer agrees to have any freight costs incurred by FCI deducted, along with applicable return to stock charges, from the credit invoice. (Exceptions are made for duplicate shipments made by FCI.)

If any repair or return equipment is received at FCI, freight collect, without prior factory consent, FCI bills the sender for these charges.

Field Service Procedures

Contact an FCI field representative to request field service.

A field service technician is dispatched to the site from either the FCI factory or one of the FCI representative offices. After the work is complete, the technician completes a preliminary field service report at the customer site and leaves a copy with the customer.

Following the service call, the technician completes a formal, detailed service report. The formal report is mailed to the customer within five days of the technician's return to the factory or office.

Field Service Rates

All field service calls are billed at the prevailing rates as listed in the FCI Price Book unless specifically excepted by the FCI Customer Service Manager. FCI reserves the right to bill for travel times at FCI's discretion.

Customers are charged for shipping costs related to the transfer of equipment to and from the job site. They are also invoiced for field service work and travel expenses by FCI's Accounting Department.

-	FLUID COMPONENTS			RA #			
	1755 La Costa Meadows Driv 760-744-6950 / 800-8 Web Site: www E-mail: techsuppor	e, San Marcos, CA 92078-5115 USA 54-1993 / Fax: 760-736-6250 <fluidcomponents.com rt@fluidcomponents.com</fluidcomponents.com 					
		Return A	uthorization Reques	st			
	Return Customer Information						
	Returning Company's	s Name:	Phone#	Phone#			
	Return Contact Nam	e:	Fax #				
	Email Address:						
	Return Address						
	Bill To:		Ship To:				
	(<u>*</u>		<u> </u>				
	States into a statest	10.1 m					
3.	Mandatory End User	Information					
	Contact:	Company:		Country:			
1.	Return Product Infor	mation					
	Model No:		Serial No(s):				
	Failure Symptoms (D	etailed Description Required).					
	What Trouble Shooti	ng Was Done Via Phone or Fie	ld Visit by FCI:		Ť		
	FCI Factory Technica	I Service Contact:					
5.	Reason For Return	Sensor Element	Electronics	As Found Testing	🖵 Credit		
		🗅 Recalibrate (New Data)	🗖 Recalibrate (Most Red	cent Data)	D Other		
	(Note: A new	Application Data Sheet (ADS)	must be submitted for all re-	calibrations and re-certifica	ations)		
	Payment Via	🗍 Faxad Purchasa Ordar		MasterCard			
	r ayment via						
(N ar	ote: A priced quotation e subject to a minimum	n is provided for all Non-Warra n evaluation charge of \$250.00)	nty repairs after equipment h	nas been evaluated. All Non	-Warranty re		
	Factory Return Shipping Address: Flu 17 Sa		Fluid Components Internation 755 La Costa Meadows Drive San Marcos, CA 92078-5115	al LLC e			

FCI Document No. 05CS000004D [U]

RA #_____



The following Return Authorization Request form and Decontamination Statement MUST be completed, signed and faxed back to FCI before a Return Authorization Number will be issued. The signed Decontamination Statement and applicable MSDS Sheets must be included with the shipment. FCI will fax, email or telephone you with the Return Authorization Number upon receipt of the signed forms.

Packing Procedures

- 1. Electronics should be wrapped in an anti-static or static-resistant bag, then wrapped in protective bubble wrap and surrounded with appropriate dunnage* in a box. Instruments weighing more than 50 lbs., or extending more than four feet, should be secured in wooden crates by bolting the assemblies in place.
- 2. The sensor head must be protected with pvc tubing, or retracted the full length of the probe, locked and secured into the Packing Gland Assembly (cap screws tightened down).
- 3. FCI can supply crates for a nominal fee.
- 4. No more than four (4) small units packaged in each carton.
- 5. FCI will not be held liable for damage caused during shipping.
- 6. To ensure immediate processing mark the RA number on the outside of the box. Items without an RA number marked on the box or crate may be delayed.
- 7. Freight must be "PrePaid" to FCI receiving door.

* Appropriate dunnage as defined by UPS, will protect package contents from a drop of 3 feet.

*** Decontamination Statement *** This Section Must Be Completed ***

Exposure to hazardous materials is regulated by Federal, State, County and City laws and regulations. These laws provide FCI's employees with the "Right to Know" the hazardous or toxic materials or substances in which they may come in contact while handling returned products. Consequently, FCI's employees must have access to data regarding the hazardous or toxic materials or substances the equipment has been exposed to while in a customer's possession. Prior to returning the instrument for evaluation/repair, FCI requires thorough compliance with these instructions. The signer of the Certificate must be either a knowledgeable Engineer, Safety Manager, Industrial Hygenist or of similar knowledge or training and responsible for the safe handling of the material to which the unit has been exposed. Returns without a legitimate Certification of Decontamination, and/or MSDS when required, are unacceptable and shall be returned at the customer's expense and risk. Properly executed Certifications of Decontamination must be provided before a repair authorization (RA) number will be issued.

Certification Of Decontamination

I certify that the returned item(s) has(have) been thoroughly and completely cleaned. If the returned item(s) has(have) been exposed to hazardous or toxic materials or substances, even though it (they) has (have) been thoroughly cleaned and decontaminated, the undersigned attests that the attached Material Data Safety Sheet(s) (MSDS) covers said materials or substances completely. Furthermore, I understand that this Certificate, and providing the MSDS, shall not waive our responsibility to provide a neutralized, decontaminated, and clean product for evaluation/repair at FCI. Cleanliness of a returned item or acceptability of the MSDS shall be at the sole discretion of FCI. Any item returned which does not comply with this certification shall be returned to your location Freight Collect and at your risk.

This certification must be signed by knowledgeable personnel responsible for maintaining or managing the safety program at your facility.

Process Flow Media

Product was or may have been exposed to the following substances:

Print Name

Authorized Signature_____Date _____Date

Company Title

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FCI Document No. 05CS000004D [U]

Instrument Warranty

Goods furnished by the Seller are to be within the limits and of the sizes published by the Seller and subject to the Seller's standard tolerances for variations. All items made by the Seller are inspected before shipment, and should any of said items prove defective due to faults in manufacture or performance under Seller approved applications, or fail to meet the written specifications accepted by the Seller, they will be replaced or repaired by Seller at no charge to Buyer provided return or notice of rejection of such material is made within a reasonable period but in no event longer than one (1) year from date of shipment to Buyer, and provided further, that an examination by Seller discloses to Seller's reasonable satisfaction that the defect is covered by this warranty and that the Buyer has not returned the equipment in a damaged condition due to Buyer's or Buyer's employees', agents', or representatives' negligence and Buyer has not tampered, modified, redesigned, misapplied, abused, or misused the goods as to cause the goods to fail. In addition, this warranty shall not cover damage caused by Buyer's exposure of the goods to corrosive or abrasive environments. Moreover, Seller shall in no event be responsible for (1) the cost or repair of any work done by Buyer on material furnished hereunder (unless specifically authorized in writing in each instance by Seller), (2) the cost or repair of any modifications added by a Distributor or a third party, (3) any consequential or incidental damages, losses, or expenses in connection with or by reason of the use of or inability to use goods purchased for any purpose, and Seller's liability shall be specifically limited to free replacement, or refund of the purchase price, at Seller's option, provided return or rejection of the goods is made consistent with this paragraph, and the Seller shall in no event be liable for transportation, installation, adjustment, loss of good will or profits, or other expenses which may arise in connection with such returned goods, or (4) the design of products or their suitability for the purpose for which they are intended or used. Should the Buyer receive defective goods as defined by this paragraph, the Buyer shall notify the Seller immediately, stating full particulars in support of his claim, and should the Seller agree to a return of the goods, the Buyer shall follow Seller's packaging and transportation directions explicitly. In no case are the goods to be returned without first obtaining a return authorization from the Seller. Any repair or replacement shall be at Seller's factory, unless otherwise directed, and shall be returned to Seller transportation prepaid by Buyer. If the returned goods shall prove defective under this clause they will be replaced or repaired by Seller at no charge to Buyer provided the return or rejection of such material is made within a reasonable period, but in no event longer than (1) year from the date of shipment of the returned goods or the unexpired terms of the original warranty period whichever is later. If the goods prove to be defective under this paragraph, the Buyer shall remove the goods immediately from the process and prepare the goods for shipment to Seller. Continued use or operation of defective goods is not warranted by Seller and damage occurring due to continued use or operation shall be for Buyer's account. Any description of the goods contained in this offer is for the sole purpose of identifying them, and any such description is not part of the basis of the bargain, and does not constitute a warranty that the goods will conform to that description. The use of any sample or model in connection with this offer is for illustrative purposes only, is not part of the basis of the bargain, and is not to be construed as a warranty that the goods will conform to the sample or model. No affirmation of that fact or promise made by the Seller, whether or not in this offer, will constitute a warranty that the goods will conform to the affirmation or promise. THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY AND ALL OTHER EXPRESS OR IMPLIED WARRANTIES WITH RESPECT TO THE GOODS OR THEIR INSTALLATION, USE, OPERATION, REPLACEMENT OR REPAIR, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS OF PURPOSE: AND THE GOODS ARE BEING PURCHASED BY BUYER "AS IS". SELLER WILL NOT BE LIABLE BY VIRTUE OF THIS WARRANTY OR OTHERWISE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL LOSS OR DAMAGE RESULTING FROM THE USE OR LOSS OF USE OF THE GOODS.



FCI's Complete Customer Commitment. Worldwide ISO 9001 and AS9100 Certified

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