Linear Link® TCI

Next Generation Temperature Compensated Transmitter

Description

The updated Linear Link® TCI represents a new, sophisticated electronics platform for flowmeter linearization and viscosity/density correction. Intended to meet the demanding requirements of the aerospace, automotive and process manufacturing industries, the Linear Link® TCI provides significant improvements in flowmeter accuracy— even under extreme temperature conditions.

The Linear Link® TCI's unique approach combines in a single instrument, temperature compensation with linearization, signal conditioning, user-selectable outputs and a wide input power voltage range.The Linear Link® TCI extends a flowmeter's useful measurement range while enhancing its low range resolution by measuring the time duration between rotor blades. The resulting volumetric flow rate is a direct relationship to this time duration, which is output using a running average update of the frequency.

The Linear Link® TCI system is complemented by a user-friendly Windows® based program — Visual Link™ 5 Software — which is used to configure the system and recall previously configured data.

Linear Link® Industrial Transmitter

Benefits

- Temperature compensated flow rate output available from one device
- Improved flowmeter accuracy
- Elimination of multiple electronic devices
- Reduced installation costs
- Complete interchangeability of flowmeters
- Stored calibration data supports ISO 9000 procedures
- Easy interface to data acquisition system
- Real time data via Visual Link™ Configuration Software

Features

- Linearizes outputs to ±0.1% of reading, typical
- Viscosity/density correction
- Analog outputs: 0-10 VDC, 0-5 VDC, 4-20mA
- Fast 20 mS response
- User-defined K-factor
- 12–32 volts power
- Compact size — remote or direct flowmeter mounting
- Rotor blade frequency averaging to minimize measurement variations
- Strouhal-Roshko compensation
- Mass flow rate output
- Stores and recalls configuration and calibration data
- User-friendly configuration software compatible with Windows® XP and Windows® 7 operating systems

FTI FLOW TECHNOLOGY™

nqa. ISO 9001 Registered

ANAB ACCREDITED

nqa. AS9100 Registered

How It Works

Period Measurement with Averaging

The Linear Link® TCI uses a precision, period-based measurement method to measure the time duration between the turbine flowmeter rotor blades while providing a user-selectable speed of response. Period-based measurement enhances the resolution in the low flow range of the turbine meter where linearization is critical. One period can be measured to minimize response time or several periods can be averaged to smooth the output in a pulsating flow. A running average is updated every period with the least current frequency being discarded as the most current frequency is acquired. These features accurately extend the range capability equal to the repeatable range of the flowmeter.

Compensation

The Linear Link® TCI's innovative, temperature-compensated linearization technique reduces viscosity effects on K-factors by establishing fluid viscosity through online temperature measurements and proper calibration methods. Linearization is calculated by linear interpolation. Fast output is achieved through a matrix method which is indexed by a temperature/viscosity compensation input. The Linear Link® TCI accepts a temperature signal from either an external or an internal RTD pickoff sensor. Up to 20 temperature data points can be entered to linearize the temperature sensor.

Strouhal-Roshko Correlation

The Linear Link® TCI compensation technique utilizes equations developed to characterize flowmeters over a wide operating temperature. The Strouhal-Roshko correlation is used to improve flowmeter accuracy by making corrections for material expansion or contraction due to temperature variations. The Strouhal-Roshko correlation is utilized to improve flowmeter measurement accuracy when the actual temperature of the installation varies significantly from the calibration condition.

Mass Flow Rate Output

Density of the process fluid is established with a known temperature/density table which resides inside the Linear Link® TCI. The temperature sensor signal is used by this table to determine the fluid density which, in turn, is multiplied by the volumetric flow rate to establish the mass flow rate. Up to 20 data points relating temperature to density can be entered.

Calibration / Programming Interface

The Visual Link™ software, with its intuitive, user-friendly PC interface, functions as a powerful calibration tool which allows the user to enter calibration and fluid property data, as well as configure the input and output signals. The software uses a toolbar with icons arranged in logical sequence to simplify the configuration of the TCI. The calibration and configuration data is stored in the Linear Link® TCI and can be recalled and viewed with the Visual Link™ software, allowing the user to have a record of the previous calibration along with a history of the instrument.

The Linear Link® TCI is configured by loading in calibration and fluid property data from a flowmeter calibration electronic data file, or entering the data manually. The date of the most recent calibration, the date of the next calibration, and comments may be stored. This feature supports ISO 9000 documentation procedures. Data for kinematic viscosity and fluid density for the liquid being measured can also be selected from a library file or entered manually. The system utilizes either an Andrade or an ASTM correlation to perform viscosity calculation. Flowmeter calibration files can be read and displayed simultaneously to assist with editing a Universal Viscosity Curve. The data can then be displayed on a graph in real-time for verification, or edited as needed for optimum characterization of the flowmeter.

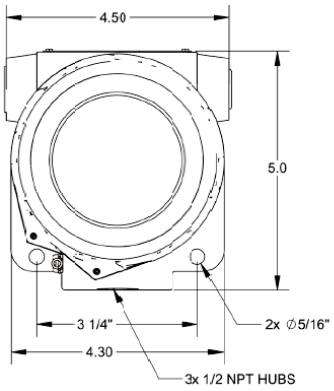
The temperature sensor data is stored in a table which includes 2 endpoints for zero and span, or multiple points for linearization, up to a maximum of 20 points. The tables can be configured for either a temperature transmitter or direct RTD sensor. The temperature sensor data can be edited and displayed graphically in real-time.

Visual Link™ is a calibration tool which also provides fluid viscosity and density profiles, unit conversion for volume, viscosity and temperature, as well as other useful functions which support flow measurement. The software is designed to operate on any system that supports a Windows® XP or 7 operating system.

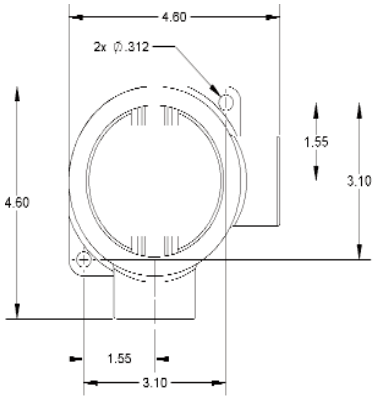
VISUAL LINK

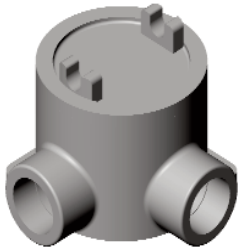
Mechanical Dimensions

Explosion Proof Display (-F1 enclosure)

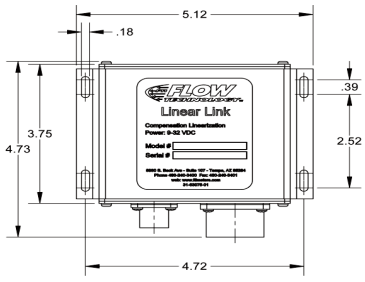


Explosion Proof (-9 enclosure)

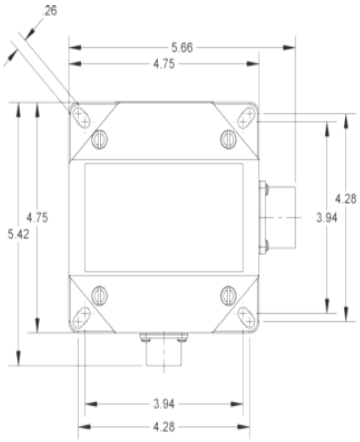


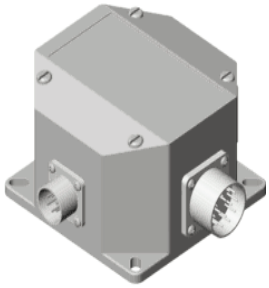


Dustight Aluminum, MS Connectors (A7 enclosure)

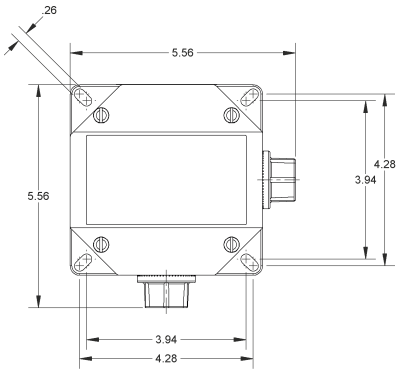


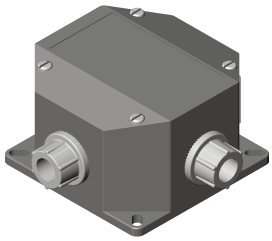
Nema 4X, MS Connections (B7 enclosure)





Nema 4X, Conduit Hubs (B6 enclosure)





Linear Link TCI

Specifications

Input Power

24 VDC nominal	12–32 VDC, no display and unloaded Vout 110mA max
	15–32 VDC, with display and unloaded Vout 160mA max
	19–32 VDC, no display and current out 135mA max
	23–32 VDC, with display and current out 200mA max

Flowmeter Input Type

Magnetic	
Frequency range:	10 Hz – 4 kHz (low Hz dependent on meter configuration)
Impedance:	Greater than 5 K ohms
Sensitivity:	20 mV p-p
Pulse	
Frequency range:	2.5 Hz to 4 kHz
Impedance:	5.8 K ohms to +5 VDC
Schmitt Trigger Buffer	
Voltage (STB):	Low: 0–1 VDC; High: 4–5 VDC
Input Maximum:	0–10 VDC, 1 Hz–4 kHz
RF	
Frequency range:	5–3500 Hz
Inductance:	1 mH
Oscillator frequency:	45–55 kHz

Temperature Input Type

RTD	
Temperature range:	-148° F to +752° F (-100° C to +400° C)
Type:	100 ohm Platinum
Voltage	0–10 VDC
0 VDC =	Minimum Temperature
10 VDC =	Maximum Temperature
Current	4–20 mA
4 mA =	Minimum Temperature
20 mA =	Maximum Temperature
Voltage	0–5 VDC
0 VDC =	Minimum Temperature
5 VDC =	Maximum Temperature

Linearization

Flowmeter K-factor	
Number of Points:	2–50
Interpolation Method:	Linear
Correlation:	Strouhal-Roshko (per \IST publication)
Temperature	
Number of Points:	2–20
Interpolation Method:	Linear
Viscosity	
Number of Points:	2–20
Interpolation Method:	Linear
Correlation:	ASTM D341-93, Andrades Equation or user-defined
Density	
Number of Points:	2–20
Interpolation Method:	Linear

Outputs

Frequency (Flow Rate)	
Flow Rate Raw Frequency:	0–5 VDC pulse
Flow Rate Linearized Frequency:	0–5 VDC pulse (1–3500 Hz)
Impedance:	2.2 K ohms
Transmission Distance:	250 ft. maximum
Analog (Flow Rate)	
Voltage	0–10 VDC or 0–5 VDC (user-specified/factory-set)
Linearized, scaled zero offset:	Less than 10 mV
Current	4–20 mA
Linearized, scaled maximum load:	R_{load} = (supply voltage – 4)/0.02
RS232 (Volume/Mass Flow, Temperature, Other)	
Baud Rate:	19200
Update Rate:	0.5/sec., 1.0/sec., or 2.0/sec.
Data Bits:	8
Stop Bit:	1
Parity:	None

Performance

Accuracy	
Linearized Frequency:	0.1% of reading or better, typical
Linearized Analog:	0.1% of full scale or better
RTD:	±1° C (does not include RTD uncertainty)
Analog Input (Temperature):	12 Bit A/D
Linearization Latency (for N=1)	9 to12 mS + period of input

Environment

Temperature	
Operating:	-40° F to +185° F (-40° C to +85° C)
with F1 display	32° F to +122° F (0° C to +50° C)
Storage:	-67° F to +257° F (-55° C to +125° C)
with F1 display	14° F to +140° F (-10° C to +60° C)
Humidity	0 to 85% RH non-condensing
Enclosure	NEMA 4X; Class I, Division 1 & 2, Group A, B, C, & D Explosion Proof; dust-tight aluminum

Communication

Interface	RS232, serial USART connection to personal computer (with serial cable)
Baud	
Output:	19200
Programming:	19.2 K
Data Bits:	8
Stop Bit:	1
Parity:	None

Approvals

CE	Directive 2004/108/EC
	Immunity Standard EN61000-6-2
	Emissions Standard EN61000-6-4

Model Numbering System

LAT	–		–			–			–	

Base Model No.

Power
3 = 12-32 VDC

Flow Meter Signal Input
A = Magnetic
B = Pulse
C = RF Carrier

Temperature Input
0 = RTD
1 = 0-10 VDC
2 = 4-20 mA
3 = 0-5 VDC

Special Configuration
XXX = Three digit Special Code (factory assigned)

Enclosure
-0 = No Enclosure
B6 = NEMA 4X with 1/2" NPT Conduit
B7 = NEMA 4X with MS Connectors (MS3106)
-9 = Class I, Div 1&2, Groups A, B, C & D Explosion Proof
A7 = Dust-tight Aluminum with MS Connectors
F1 = Rate and Total Display, Adalet XIHFGCX2L Explosion Proof Enclosure

Outputs
V1 = Analog Voltage (0-10 VDC) for Flow Rate
V2 = Analog Voltage (0-5 VDC) for Flow Rate
MA = Analog Current (4-20mA) for Flow Rate
Note: Options V1, V2, and MA include flow meter frequency linear and raw output.

Programming Cables

	Choose one for field programming changes
Basic	19-62627-104
MS Connector version only	19-62627-105

FTI FLOW TECHNOLOGY™

8930 S. Beck Avenue, Suite 107, Tempe, Arizona 85284 USA
Tel: (480) 240-3400 • Fax: (480) 240-3401 • Toll Free: 1-800-528-4225
E-mail: ftimarket@ftimeters.com • Web: www.ftimeters.com