SERIES 504FTB

IN-LINE MASS FLOW TRANSMITTERS

KURZ INSTRUMENTS INC.™

SERIES 504FTB IN-LINE MASS FLOW TRANSMITTERS

DESCRIPTION

The Series 504FTB has many improvements and features that greatly enhance the performance of the original Series 504FT. These include a Patented digital thermal anemometer circuit, a more convenient optional remote electronics mounting bracket, a one-piece PCB for improved reliability and ease-of-use, two relays, and many other unique Kurz engineering and functional features. More convenient Directly Attached or Remotely Attached Electronic Enclosure Configurations are standard. The Series 504FTB is powered by +24 VDC or 85 to 265 VAC, 47 to 63 Hertz. The new 504FTB has 10 Models covering Mass Flow ranges to 1000 SCFM, in-line sizes from 1/2" to 4" pipes. Models have CE Compliance which meets all EC directives at the time of sale. All models have Non-Incendive and Explosion-Proof/Flame-Proof Safety Approvals and are IP66 NEMA 4X/7 Rated. Kurz is an ISO 9001:2000 Quality Manufacturer.

KEY FEATURES

- Patented constant temperature sensor control circuit.
- Two-line 16 character, back-lit Liquid Crystal Display, with twenty button keypad (optional).
- User selectable scrolling display.
- Easy-to-Use menu for display and set-up with HELP screens.
- Configuration upload/download software using a PC.
- Adjustable LCD/Keypad orientation allowing ease of reading the display for any Flow Body orientation.
- Electronics operating temperature range of -25°C to +65°C, non-condensing; and -40°C to +65°C without the LCD/Keypad option.
- Two optically isolated loop-powered 4-20 mA outputs, one for mass flow rate or mass velocity, one for process temperature (optional).
- 4-20 mA outputs meet NAMUR NE43 recommendations.
- Two optically isolated solid-state alarm relays (optional).
- Pulsed output for use as a remote flow totalizer (optional).
- User selected English or Metric Units (SCFM, SCFH, PPM, PPH, °F; NLPM, NCMH, KGM, KGH, °C).
- Multi-Point calibration correction factors for Flow and Temperature.
- User-entered METER ID.
- Programmable sensor out-of-tolerance indication and alarm functions.
- User may change STP reference conditions.
- User-selectable digital filtering for each output.
- Built-in flow totalizers and elapsed timer.
- User Access Code.
- USB port for terminal operations.
- IP66/NEMA 4X/7 dual-chamber and single-chamber epoxy painted electronics enclosure.
- CE Compliance, including the current EMC, ATEX, LVD, PED, WEEE and ROHS EV Directives.
- Input power options of 85 to 265 VAC, 47 to 63 Hz or 24 VDC.
- Process Temperature Rating of -40°C to 125°C.
- Process Pressure Rating up to 300 PSIG.
- Alloy C-276 all-welded sensor construction.
- Fastest response to temperature and velocity changes.
- Flow Body orientation Independent.
- Sensor lead length independent circuitry.
- All components pass an extensive burn-in test for high reliability.
- Modbus local area network with RS-485 port.
- Remote Electronics Enclosure options.
- Compatible with Series 155 Mass Flow Computers to provide flow and temperature readings and exceptional flexibility.
- Single PCB for enhanced simplicity and reliability.

APPLICATIONS

- Industrial and process gas mass flow
- Fuel flow for burners and fuel cells
- NO_X control using ammonia
- Aeration air and Digester gas for waste water treatment facilities
- Compressed air
- Natural gas
- Combustion air
- Metering semi-conductor gases
- Chlorine metering in the paper industry
- Solvent and VOC recovery
- Air sampling
- General purpose mass flow, R&D
- Flow calibration standards
- Nuclear power plants
- Air sampling in D.O.E. facilities
- O.E.M. applications

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PRINCIPLE OF OPERATION

The Series 504FTB uses the well-proven Kurz thermal convection mass flow measurement method by detecting the heat transfer from the self-heated RTD sensor (Rp) referenced to the temperature of the ambient gas stream RTD sensor (Rtc). A constant temperature difference between the heated sensor and the temperature sensor is maintained by a Patented digital Wheatstone Bridge circuit in which the heated sensor is the controlled element. This provides unexcelled speed of response and the many other advantages of constant temperature thermal anemometry. The microprocessor-based electronics measures the heat transfer, computes the standard velocity and ambient gas temperature, and allows the user to configure and set-up the 504FTB to fit all flow requirements. Display screens are easy-to-use and provide all the flow, temperature and diagnostic information. For a more detailed description of Kurz technology, please see Document Number 364003 "Theory and Application of Kurz Thermal Convection Mass Flow Meters," or by visiting our web site.

CALIBRATION CURVE

Figure 1–*The basic calibration curve is non-linear, having a non-zero output (live zero) at zero flow and a nearly constant percent of reading accuracy. Zero is a valid data point for a Kurz meter. The 504FTB provides a linear output.*

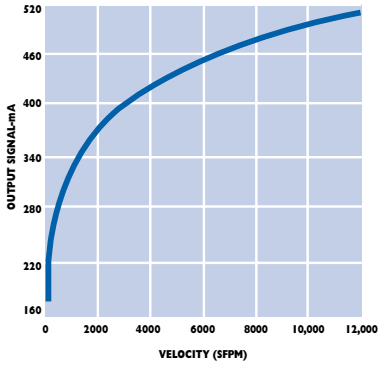

Fig. 1

FLOW ELEMENT CONSTRUCTION

Figure 2–*Shows a typical cross-section of Model 504FTB-6A thru 504FTB-16.*

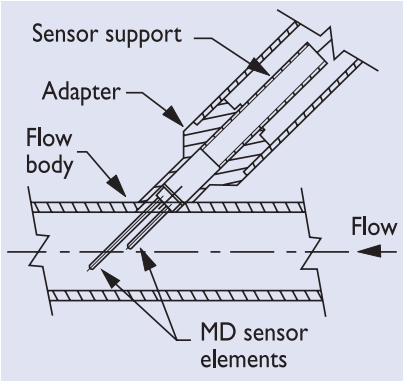

Fig. 2

TIME RESPONSE TO FLOW AND TEMPERATURE CHANGES

Figure 3–*Shows the response of a Kurz sensor to a step change in velocity at a constant process gas temperature.*

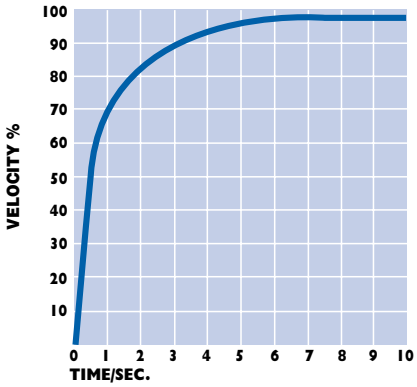

Fig. 3–*Sensor Flow Response.*

Figure 4–*Shows a typical response to a step change in temperature at a constant mass flow rate.*

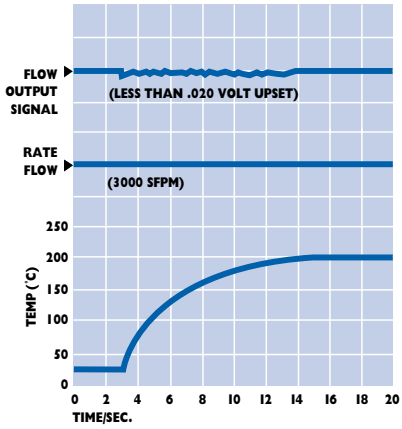

Fig. 4–*Sensor Temperature Response.*

OUR MISSION

To manufacture and market the best thermal mass flow meters available and to support our customers in their efforts to improve their business.

SPECIFICATIONS

Process Gas Temperature Rating:
-40°C to +125°C

Process Gas Pressure Rating:
Up to 300 PSIG (20 BARg)

Sensor Material:
Alloy C-276

Flow Body Material:
316L SS

Repeatability: 0.25%

Velocity Time Constant:
1 second for velocity changes at 6000 SFPM at a constant temperature and 1 second for temperature changes at a constant velocity of 6000 SFPM.

Process Temperature Time Constant: 8 seconds at a velocity of 6000 SFPM.

Flow Accuracy: See Feature 4 for overall accuracy including temperature effects.

Temperature Accuracy:
±(1/2% of reading +1°C) for velocities above 100 SPFM.

Power: +24 VDC ±10%, 85-265 VAC ±10% 47-63 Hz; 24 watts max.

Enclosure Temperature:
Rating: –25°C to +65°C with LCD/Keypad option; –40°C to +65°C without LCD/Keypad option.

Enclosure: Dual-Chamber and Single-Chamber Epoxy-Painted aluminum, IP66/NEMA 4X/7 with glass window for display option.

Solid-State Relays:
Two, optically isolated, .8 ampere, 24 VAC/VDC maximum.

Analog Outputs (4-20 mA):
Optically isolated, user loop-powered, 12 bit resolution and accuracy, maximum loop-resistance is 500Ω at 18 VDC, 800Ω at 24 VDC, 1400Ω at 36 VDC; meets NAMUR NE43 recommendations.

Analog Input (4-20mA):
One non-isolated.

Meter Filter Time Constant:
Selectable 0 to 600 seconds.

Continued on next page

TECHNICAL DESCRIPTION

SENSOR DESIGN

Series 504FTB In-Line Mass Flow Transmitters use the Kurz MetalClad™, "MD" and "FD2" all-welded Alloy C-276 sensors. In this design, the temperature sensor and velocity sensor are mounted in separate tubes (or "stings"), providing exceptional thermal isolation from the sensor support structure and a fast response to process temperature changes.

PROCESS TEMPERATURE COMPENSATION

The influence of temperature on the thermal properties of gases requires temperature compensation for repeatable and accurate measurements. Kurz temperature compensation is the most advanced and is exceptional.

GAS CALIBRATION

The customer has a choice of a laboratory calibration or a gas correlation calibration for most Industrial Gases.

SENSOR PROTECTION

The 504FTB circuitry includes circuitry to prevent an over-temperature condition caused by a sensor, wiring or component failure. Kurz sensors will not overheat at zero flow, unlike most competitive devices because of the constant temperature sensor control and the power limiting design.

SENSOR ELECTRONICS

The Series 504FTB has several innovations which improve performance and provides extraordinary flexibility. A new constant temperature digital bridge circuit includes an efficient switching power supply. The single bridge PCB has an EEPROM loaded with the PCB serial number, calibration coefficients, and component values which insures the safety of the data. The sensor electronics includes a sensor lead resistance compensation circuit which is extremely important for long sensor wires, rapid gas temperature changes and large temperature gradients between the sensor and the ambient air.

FIRMWARE

The Display, Executive and Programming menus are very easy-to-use and are largely self-explanatory. The flow and temperature data may be scrolled so it can be seen through the window in the cover. The user may press "D" and see the flow and temperature data, as well as the raw flow data. Pressing "H" holds the display screen (but not the readings). A user code is required for programming, seeing data and entering configuration and other user data.

SELF-DIAGNOSTICS

The 504FTB performs an extensive check-out upon power-up, and continuously monitors the sensor inputs/outputs and verifies the integrity of the sensor wiring, and the measurements. The Sensor Kick-Out feature can be used to set the fault limits.

PROGRAMMABLE CORRECTION FACTORS

A Multi-Point Variable Correction Factor may be used to correct the flow calibration data to meet in-situ or laboratory flow tests. A Bias Correction Factor (BCF) may also be selected.

METER FILTER TIME CONSTANT

A digital filter time constant may be set for each METER which affects the display readings and the 4-20 mA outputs. The time constant may be set from 0 to 600 seconds.

SELECTABLE STP CONDITIONS

The mass flow calibration data is referenced to the Kurz laboratory standard of 77° F/14.69 PSIA (25°C/760 mmHg). The user may change the STP conditions.

COMPATIBILITY WITH SERIES 155 MASS FLOW COMPUTERS

A Series 504FTB (ordered with the 4-20 mA Outputs and the +24 VDC power supply; with or without the LCD/Keypad and Alarm/Relay/Pulsed Outputs) is fully compatible with the inputs and features of the Series 155 Mass Flow Computers. (Please see the Series 155 brochure).

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SPECIFICATIONS cont'd.

Safety Approvals:
CSA Non-Incendive Approval:
IEC 79-15 and EN60079-0/15

ATEX Non-Incendive Approval:
EN60079-0/15 and EN61241-1

CSA Explosion-Proof Approval:
IEC 79-01 and EN60079-01

ATEX Flame-Proof Safety Approval:
EN 60079-0/1

Note: *See Kurz website for the complete Safety Approvals Specifications.*

CE Directives:
EMC, ATEX, LVD, WEEE and ROHS Directives for all models. PED Directives only for Models 504FTB-06, -06A -08, -12, -16, -24, -32 Consult Kurz for details.

Serial Port Baud Rate:
User selectable: 9600, 14,400, 19,200, 38,400, 57,600.

Communication Ports:
RS485 Modbus ASCII or RTU Mode, and USB.

LCD: Back-lit two-line alphanumeric with 16 characters per line.

LCD Update:
Every two seconds.

Keypad: 20-button membrane mounted inside enclosure.

LCD/Keypad Orientation:
Adjustable in 90° increments to accommodate user viewing angle.

Memory: EEPROM for all important data, with automatic sensor identification; Flash EEPROM for Program Memory.

Net Weight:
See Table, Page 11

TECHNICAL DESCRIPTION cont'd.

4-20 mA OUTPUTS

These loop-powered outputs are optically isolated, and include the NAMUR NE43 recommendation regarding fault detection. The fault conditions are generally set at the Kurz Factory, but may be set by the user. The user may easily re-calibrate the 4-20 mA outputs by entering "CALIB 4-20 mA OUTPUTS" measuring the output and adjusting it using the LCD/Keypad up/down buttons. The 4-20mA outputs may be set-up for non-isolated, self-powered operation.

NAMUR NE43 COMPLIANCE

Kurz meets the NAMUR NE43 recommendation for the 4-20 mA outputs, under a fault defined by the sensor Kick-Out menu, sensor or system fault.
A NE43 alarm may be selected as high or low, but not both. This feature also frees up the alarm/relays so that the user can set-up the flow and temperature alarms for other needs.

ALARM/RELAYS/PULSED TOTALIZER OUTPUT

The customer may order 2 solid-state optically isolated relays. If no relays are ordered, the alarm functions are displayed on the LCD. Both relays may be used for alarms (LO, HI and HOL) or for the Sensor Kick-Out feature; or one relay may be used for an alarm function and one may be used as a pulsed output for use as a remote flow totalizer, or both relays may be used as pulsed outputs. Totalizers may be automatically reset at a specific total quantity (i.e., 10,000 SCF).

HELP SCREENS

By pressing "HH" the user can obtain important information on the use of the Series 504FTB, including the software version, Kurz telephone and fax numbers and the web site address, etc.

ANALOG INPUT

One non-isolated 4-20mA input for use as a remote set-point for the built-in PID Flow Controller.

USB PORT

A USB port for terminal operations includes a COM emulator driver which can be accessed using a PC terminal emulator program to remotely "echo" the LCD and keypad functions and upload/download the system configuration and calibration data files using XMODEM protocol. The Series 504FTB may be operated in a manual or remote terminal manner. Measurement summary data may be initiated manually and by pushing the "L" button on the keypad or from the PC. The information may also be obtained automatically by activating the LOG interval timer using the Series 504FTB keypad or a PC.

MODBUS

The Modbus local network protocol (ASCII or RTU) is included. The use of Modbus is extremely useful, as most features may be accessed, including configuration up-load, down-load, etc.

FLOW CONTROLLER

A PID Flow Controller is included, see Feature 9.

ORDERING INFORMATION

Table 1 lists the Parent Number of the standard models, size, sensor type and flow area. **Table 2** lists the standard full-scale flow range for each Model Number for most Industrial Gases. **Table 3** lists the pressure drop at the listed full-scale flow rate range for most Industrial Gases.

TABLE 1: SERIES 504FTB IN-LINE MASS FLOW TRANSMITTERS

Model Number	*Parent Number*	*Sensor Type*	*Schedule 40 Pipe Size and Length*	*A* Flow Area (FT^2)*
504FTB-6A	755960	MD	⅜" x 7"	0.00044
504FTB-6	755961	MD	⅜" x 7"	0.00107
504FTB-8	755962	MD	½" x 8"	0.00179
504FTB-12	755963	MD	¾" x 10"	0.00328
504FTB-16	755964	MD	1" x 12"	0.00546
504FTB-24	755965	MD	1½" x 18"	0.01337
504FTB-32	755966	MD	2" x 24"	0.02253
504FTB-40	755967	FD2	2½" x 24"	0.03248
504FTB-48	755968	FD2	3" x 24"	0.05057
504FTB-64	755969	FD2	4" x 24"	0.08763

FD2 Sensor Models use an all-welded construction with a compression fitting for mounting the sensor support. Please see the outline drawings.

TABLE 2: STANDARD FULL SCALE FLOW RANGES (Q_{MAX})

Model Number	Q_{MAX} Flow in SCFM (NCMH), Note 1					
	Gas Group Number and Gas Type					
	A Air, N_2, O_2, Ar CO_2	C Methane Digester Gas, Dry Ammonia	D Dry Chlorine, Ethylene	E Ethane	F Helium, Propane Butane	G Hydrogen
504FTB-06A	2 (3.1)	1.8 (2.8)	1.7 (2.6)	1.5 (2.3)	1 (1.56)	1 (1.56)
504FTB-06	10 (15.6)	9.5 (14.8)	8 (12.5)	7 (11)	5 (7.8)	3 (4.7)
504FTB-08	20 (31)	19 (29.6)	16 (25)	14 (22)	10 (15.5)	5 (7.8)
504FTB-12	40 (62)	38 (59)	33 (51.5)	28 (44)	20 (31)	15 (23.4)
504FTB-16	75 (117)	71 (111)	62 (97)	55 (86)	40 (62)	30 (46.8)
504FTB-24	150 (234)	140 (218)	125 (195)	110 (172)	100 (156)	75 (117)
504FTB-32	300 (468)	285 (445)	250 (390)	220 (344)	150 (234)	100 (156)
504FTB-40	400 (624)	380 (593)	333 (520)	296 (462)	200 (312)	150 (234)
504FTB-48	600 (936)	570 (889)	500 (780)	445 (694)	300 (468)	200 (312)
504FTB-64	1000 (1560)	950 (1482)	833 (1300)	740 (1154)	600 (936)	400 (624)

Note 1: *SCFM: Standard Cubic Feet-Per-Minute (Ref.: 77°F, 14.69 PSIA).*
NCMH: Normal Cubic Meters-Per-Hour (Ref.: 0°C, 760 mmHg).
NCMH = 1.56 x SFPM (Approximate).

TABLE 4: ESTIMATED PRESSURE DROP (DP_S) (Note 1)

Gas Type	Pressure Drop inches water (mm water)
Air	30 (762)
Argon	40 (1016)
Butane	18 (457)
Carbon Dioxide	45 (1143)
Dry Ammonia	18 (457)
Dry Chlorine	51 (1295)
Ethane	18 (457)
Ethylene	20 (508)
Helium	2 (51)
Hydrogen	1 (25)
Methane	15 (381)
Digester Gas: 50% CH_4, 50% CO_2	28 (711)
Digester Gas: 60% CH_4, 40% CO_2	25 (635)
Digester Gas: 70% CH_4, 30% CO_2	23 (584)
Nitrogen	29 (737)
Oxygen	33 (838)
Propane	14 (356)
Special Gases – Consult Kurz	

Note 1: *The Estimated Standard Drop (DP_2) is the End-to-End pressure drop at Standard Conditions at the Standard Full Scale Flow Rate (Q_{MAX}) listed in Table 2.*

NOMENCLATURE:

SENSOR TYPE

Identifier	Description
MD	"Mini-Dual" MetalClad™ all-welded sensor, .074" diameter elements.
FD2	"Fast-Dual" MetalClad™ all-welded sensor, 0.105" diameter elements.

END CONNECTION TYPES

Identifier	Description	Pressure Rating (PSIG)
MNPT	Male Pipe Threads (USA)	150
CL150	Class 150 ANSI B16.5 Raised Face Flanges	150
CL300	Class 300 ANSI B16.5 Raised Face Flanges	300

FLOW AREA

Identifier	Description
A*	Area (FT^2) of effective flow area at the sensor location.

DEFINITIONS FOR THE USE OF TABLES 1, 2, 3:

Equation 1: $DR_P = \frac{P_P}{P_S} \times \frac{T_S}{T_P}$

Equation 2: $DP_P = \frac{1}{DR_P} \times \left(\frac{Q_P}{Q_{MAX}}\right)^2 \times DP_S$

Q_P = Process Flow Rate (SCFM for English Units, NCMH for Metric Units).

Q_{MAX} = Maximum flow rate for a specific gas type and model number (Table 2).

T_S = Standard Process Absolute Temperature: 537°R (77°F + 460) for English Units or 273°K (0°C) for Metric Units.

T_P = Process Absolute Temperature: °R (T°F + 460) for English Units or T°K (T°C + 273°C) for Metric Units.

P_S = Standard Absolute Pressure (14.69 PSIA for English Units or 760 mm Hg for Metric Units).

P_P = Process Absolute Gas Pressure (PSIA for English Units and mm Hg for Metric Units).

DR_P = Process Gas Density Ratio.

DP_P = Estimated Pressure Drop at Process conditions (inches water or millimeters of water).

DP_S = Standard Pressure Drop (See Table 3, use either inches of water for English Units or millimeters of water for Metric Units).

PART NUMBER GENERATION PROCEDURE

Select the Model 504FTB that meets the full scale flow rate, pressure drop and pipe or flange size. With the selected Parent Number, specify the entire Part Number by selecting an Option for each Feature as shown in the Part Number example below.

755964	A	32	B	1	F	01	A	015	B	537
Parent Number	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10

SUMMARY OF FEATURES

Feature	Feature Description
1	**Electronics Enclosure Configuration/Input Power, LCD/Keypad**
2	**Sensor Material/Flow Body and Flange Material**
3	**Flow Body Connection Type**
4	**Process Temperature Compensation**
5	**Gas Flow Rate Calibration Data Range**
6	**Specialty Gas Flow Rate Calibration**
7	**Safety Approval**
8	**Process Pressure**
9	**Analog & Digital Inputs/Outputs**
10	**Process Temperature**

FEATURE 1: ELECTRONICS ENCLOSURE CONFIGURATION AND INPUT POWER (See Note 1, 2)

Option	Description
A	Directly Attached Dual-Chamber Electronics Enclosure, AC-Power, LCD/Keypad.
B	Directly Attached Dual-Chamber Electronics Enclosure, AC-Power, without LCD/Keypad.
C	Directly Attached Dual-Chamber Electronics Enclosure rotated 180° for viewing, AC Power, LCD/Keypad.
D	Remote Dual-Chamber Electronics Enclosure, AC-Power, LCD/Keypad.
E	Remote Dual-Chamber Electronics Enclosure, AC-Power, without LCD/Keypad.
F	Directly Attached Dual-Chamber Electronics Enclosure, 24VDC-Power, LCD Keypad.
G	Directly Attached Dual-Chamber Electronics Enclosure rotated 180° for viewing, 24VDC-Power, LCD/Keypad.

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FEATURE 1: ELECTRONICS ENCLOSURE CONFIGURATION AND INPUT POWER (See Note 1, 2) Continued	
Option	**Description**
H	Directly Attached Single-Chamber Electronics Enclosure, 24VDC-Power, without LCD/Keypad.
I	Remote Dual-Chamber Electronics Enclosure, 24 VDC-Power, LCD/Keypad.
J	Remote Single-Chamber Electronics Enclosure, 24 VDC-Power, without LCD/Keypad.

Note 1: *The Temperature storage and operating rating of the Electronics Enclosure is -25°C to + 65°C with the LCD/Keypad and -40°C to +65°C without the LCD/Keypad. If the process gas temperature or the ambient temperature is greater than 65°C, then the remote electronics enclosure must be used (options D, E, I, J).*
Note 2: *The conduit or cable seal must be installed by an experienced and careful installer to prevent water intrusion into the enclosure and to maintain the enclosure rating. Failure to properly install the conduit seals may void the Kurz Warranty and may compromise the safety approval rating.*

FIRST DIGIT OF FEATURE 2: SENSOR MATERIAL	
Option	**Description**
3	Alloy C-276

SECOND DIGIT OF FEATURE 2: FLOW BODY AND FLANGE MATERIAL	
Option	**Description**
2	316L Stainless Steel

FEATURE 3: FLOW BODY CONNECTION TYPE		
Option	**Description**	**Pressure Rating(PSIG)**
A	Male NPT Pipe Ends (MNPT)	150
B	Class 150 ANSI B16.5 Flanges (CL150)	150
C	Class 300 ANSI B16.5 Flanges (CL300)	300

FEATURE 4: PROCESS TEMPERATURE COMPENSATION	
Option	**Description**
I	Standard Temperature Compensation over process temperature range of -40°C to +125°C for all gases. Uncertainty: ±[3% + 0.025%/°C) of Reading + (A*) (75 SFPM + 0.25 SFPM/°C], above or below 25°C. A* is the flow area of the flow measurement section of the Model 504FTB, see **Table 1**. This accuracy specification assumes an upstream, unobstructed L/D of 30:1 and a down stream, unobstructed L/D of 10:1

FEATURE 5: GAS FLOW RATE CALIBRATION DATA RANGE (NOTE 1)			
Option	**Description**	**Option**	**Description**
A	100% of Q_{MAX}	**I**	60% of Q_{MAX}
B	95% of Q_{MAX}	**J**	55% of Q_{MAX}
C	90% of Q_{MAX}	**K**	50% of Q_{MAX}
D	85% of Q_{MAX}	**L**	45% of Q_{MAX}
E	80% of Q_{MAX}	**M**	40% of Q_{MAX}
F	75% of Q_{MAX}	**N**	35% of Q_{MAX}
G	70% of Q_{MAX}	**P**	30% of Q_{MAX}
H	65% of Q_{MAX}	**Q**	25% of Q_{MAX}

Note 1: *See Table 2*

FEATURE 6: SPECIALTY GAS FLOW CALIBRATION

There are two gas flow calibration methods available:
1. Laboratory Gas Flow Calibration
2. Correlation Gas Flow Calibration in which the In-Line Mass Flow Transmitter is calibrated in air and experimentally derived correlation factors are used to obtain calibration data for the required gas type.

For either type of calibration select the option that is equal-to-or-greater than Process Flow Rate (Q_P) calculated using Feature 5 and Table 2.

FEATURE 6: SPECIALTY GAS VELOCITY CALIBRATION (Note 1)			
Laboratory Calibration		***Gas Type***	***Correlation Calibration Option***
Option	***Pressure***		
01	Ambient	Air	–
07	to 150 PSIA	Air	–
–	–	Dry Ammonia	**56**
08	to 150 PSIA	Argon	**58**
–	–	Butane	**60**
14	to 150 PSIA	Carbon Dioxide	**64**
–	–	Dry Chlorine	**68**
20	to 150 PSIA	Ethane	**70**
22	to 150 PSIA	Ethylene	**72**
26	to 150 PSIA	Helium	**76**
28	to 150 PSIA	Hydrogen	**78**
32	to 150 PSIA	Methane	**82**
35	to 150 PSIA	"Digester Gas" 50% CH_4, 50% CO_2	**85**
36	to 150 PSIA	"Digester Gas" 60% CH_4, 40% CO_2	**86**
37	to 150 PSIA	"Digester Gas" 70% CH_4, 30% CO_2	**87**
40	to 150 PSIA	Nitrogen	**90**
44	to 150 PSIA	Oxygen (Note 2)	**94**
46	to 50 PSIA	Propane	**96**

Note 1: *Laboratory Gas calibrations are performed with gases of high purity and are NIST Traceable. Customer must specify calibration pressure. (Feature 8). Correlation calibrations are based on experimental data correlated to an air calibration at ambient pressure and temperature. The user's flow element is calibrated in air, and an additional calibration data sheet is made for the specialty gas based upon the correlation factors. Add ±5% of Reading to the accuracy specifications when using a gas correlation calibration.*
Note 2: *It is the customer's responsibility to insure that the Mass Flow Element is clean of Hydrocarbons and is safe for oxygen use. (See Accessories in Section C-1 for Cleaning and Bagging).*

FEATURE 7: SAFETY APPROVALS (Note 1)	
Option	**Description**
A	Non-Incendive (NI), CSA, ATEX and IECEx Ex nA II, T6, T5, T4 or T150°C (electronics enclosure) Ex nA II, T5 or T3 (sensing element)
B	Explosion-Proof/Flame-Proof, CSA, ATEX and IECEx Ex d IIB + H2, T6, T4, T110°C or T150°C (electronics enclosure) Ex d IIB + H2, T4 or T3 (sensing element)

Note 1: *See Specifications, Page 5.*

FEATURE 8: PROCESS PRESSURE

Enter the Absolute Pressure (PSIA), rounded off to 3 digits. Example: For a Process Absolute Pressure of 14.7 PSIA, enter 015; for 150 PSIA, enter 150.

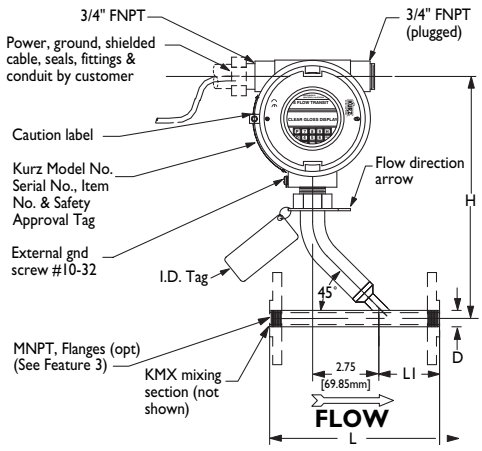
FEATURE 9: ANALOG AND DIGITAL OUTPUTS	
Option	**Description**
B	Two 4-20 mA Optically Isolated Outputs (Note 1).
C	Two 4-20 mA Optically Isolated Outputs, two solid-state Relays (maximum 12 watts), one external non-isolated 4-20mA Input (Note 2).

Note 1: *For Process Measurement Analog Outputs, NAMUR NE43 Alarms.*
Note 2: *Required for Process Measurement Analog Outputs, NAMUR NE43 Alarms, Alarm Relays, and Pulsed Flow Totalizer.*

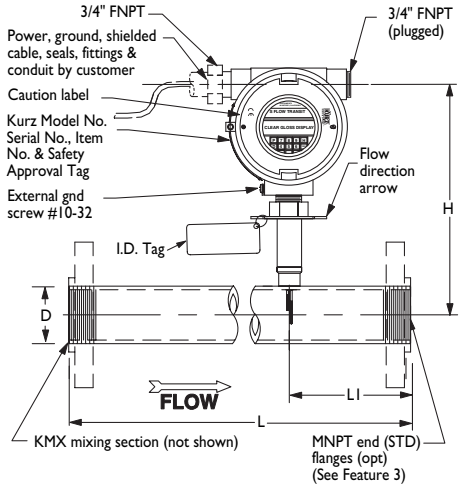
FEATURE 10: PROCESS TEMPERATURE

Enter the Absolute Process Temperature (°Rankin = °F + 460) rounded off to 3 digits. Example: For a Process Temperature of 77°F, enter 537.

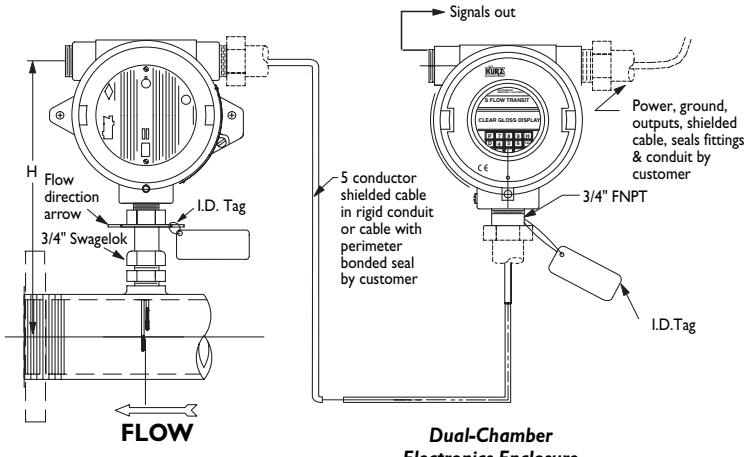
SERIES 504FTB OUTLINE DRAWINGS



Models 504FTB-6A, -6, -8, -12, -16
Shown Directly Attached with Standard Display Orientation

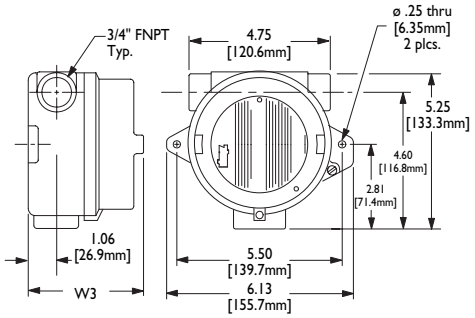


Models 504FTB-24, -32
Shown Directly Attached with Standard Display Orientation



Single-Chamber Sensor Wire Junction Box

Dual-Chamber Electronics Enclosure



Enclosure Type	*W_3*
Junction Box	3.88 [99mm]
Electronic Enclosure	5.94 [151mm]

Models 504FTB-40, -48, -64
Shown with Enclosure Remotely Attached

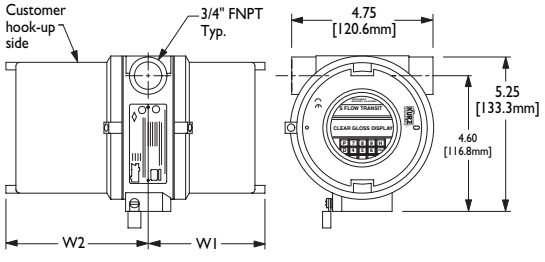


TABLE 3: SERIES 504FTB IN-LINE MASS FLOW TRANSMITTERS DIMENSIONS

Model Number	*D (in)*	*Flange Size (in)*	*L (in)*	*L1 (in)*	*H (in)*	*Net Wt. Lbs. (See Note 1)*	
						Threaded	*Flanged*
504FTB-6A	.675	½	7	2.5	9.94	6.5	9.0
504FTB-6	.675	½	7	2.5	9.94	6.5	9.0
504FTB-8	.840	½	8	3	10.02	6.5	9.0
504FTB-12	1.050	¾	10	3	10.13	7.0	10.0
504FTB-16	1.315	1	12	3.5	10.25	7.5	11.5
504FTB-24	1.90	1½	18	4	10.55	10.0	18.0
504FTB-32	2.375	2	24	5	9.54	13.0	26.0
504FTB-40	2.875	2½	24	5	12.03	NA	36.5
504FTB-48	3.500	3	24	5	12.45	NA	46.0
504FTB-64	4.500	4	24	5	12.85	NA	61.5

Note 1: *Add 3.3 lbs for AC Option. Add 4 lbs for Remote Option.*

Input Power	*Display/ Keypad*	*W1*	*W2*
AC	Yes	3.41" (87mm)	4.69" [119mm]
AC	No	2.75" [70mm]	4.69" [119mm]
24 VDC	Yes	3.41" [87mm]	4.69" [119mm]

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