KURZ INSTRUMENTS INC.™

Complex Technology Made Simple

Technical Reference

Thermal Mass Flow Meter Quick Start Guide

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Preface

Before You Begin

Important ***The device warranty is void if the device is not installed in accordance with the specified installation requirements. Read and thoroughly understand the installation requirements before attempting to install the device. If you have any questions, contact your Kurz customer service representative before attempting installation.***

Using this Manual

Kurz Instruments, Inc., documentation includes manuals, product literature, Adobe Acrobat PDF files, and application online Help files. The Kurz Instruments CD contains all the available documentation files. To read PDF files, download the free Adobe Acrobat Reader from www.adobe.com.

The Kurz Instruments Web site provides additional information:

- **World Wide Web:** www.kurzinstruments.com
- **Email:** service@kurzinstruments.com
- Documentation links to the most current manuals and literature

You can access device support in the following ways:

- **Main:** 831-646-5911
- **Phone:** 800-424-7356
- **Fax:** 831-646-8901

Manual Conventions

The following table lists conventions used in the Kurz Instruments, Inc., documentation, and gives an example of how each convention is applied.

Table 1. Conventions used in this manual

Convention	For Example
Text type, click, or select (for example, field names, menus, and commands) are shown in bold.	Check the **Configuration File** checkbox.
Text appearing in a display or window is shown in courier.	`PRESS ENTER TO` `SET METER DATA`
An arrow (→) is used to separate a menu name from its menu command.	Select **Start→All Programs→Kurz Instruments→KzComm**.
Simplified directory structures and path names are used in examples. Your folder names may be different.	Programs Files\Kurz Instruments\KzComm.

Chapter 1

Installation

Overview

Thank you for purchase one of the finest thermal mass flow meters available in the industry. Kurz Instruments has a strong reputation for designing and manufacturing highly accurate and responsive thermal mass flow meters for industrial gas flow measurement. For more than 35 years our team has successfully provided solutions to our customers most demanding and difficult applications. Kurz products are used in a wide variety of industrial applications including combustion air, aeration air flow, digester gas, nuclear power plants, flare stack monitoring, and compressed air.

This guide is for the following B-Series devices using firmware v2.x:

- Series 454FTB (insertion)
- Series 454FTB-WGF (insertion)
- Series 504FTB (in-line)
- Series 504FTB-CL2 (in-line)
- Series 534FTB (in-line)
- Series K-BAR 2000B (multipoint)

This *Quick Start Guide* is an abbreviated version of the *B-Series Hardware Guide.* Once your flow meter is correctly installed, refer to the following guides:

- *B-Series Operations Guide* – Chapter 1, “B-Series Flow Meter Modes & Menus,” and “Display Mode — Basic Access” in Chapter 2.
- *KzComm User Guide* for accessing your flow meter configuration parameters using KzComm or a terminal emulator, and configuring the USB port.

All guides are available on the customer CD and online.

Unpacking

Your Kurz flow meter is shipped with the following items:

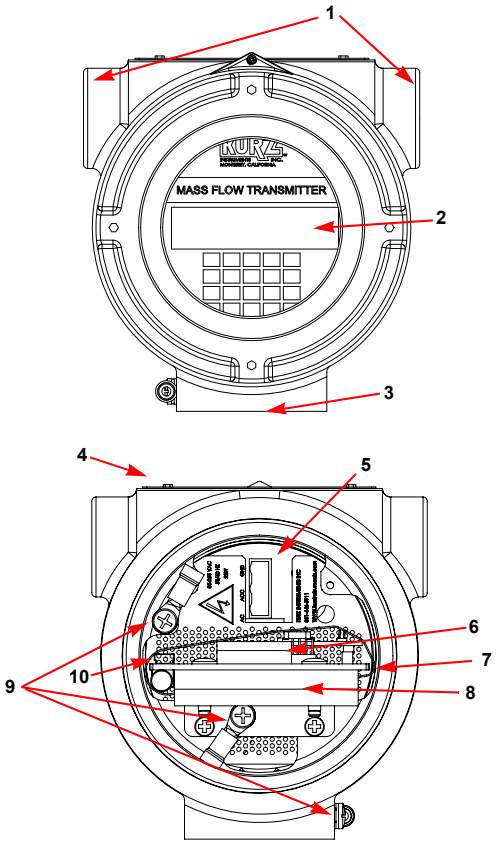
- Flow meter
- Calibration certificate
- Customer CD
- Quick lookup card (additional copies are available in the *B-Series Operations Guide* and the *B-Series Hardware Installation Guide*)

Hardware Description

The Kurz flow meter electronics head has front and back covers. The front cover allows access to the display/keypad (optional), and the back cover allows access to wiring connections.

The features for the B-Series flow meter shown in the figure include:

1. ¾-inch FNPT signal and power conduit ports
2. Backlit 2x16-character display and 20-character keypad interface (optional)
3. ¾-inch FNPT sensor support port (transmitter-attached version), conduit or cable port (transmitter-separate version)
4. Safety label and product ID tag
5. AC power input — 85 to 265 VAC 50/60 Hz 1 phase
6. Optional hardware, AI, DO, DI, Purge valve, I/O connector TB6
7. Power indicator — green LED, right side of TB1
8. Main I/O wiring terminal block for sensor, power, RS-485 and 4-20 mA outputs, TB1
9. External and internal ground lug locations and shielded wire pig-tail termination location
10. USB mini-B connector

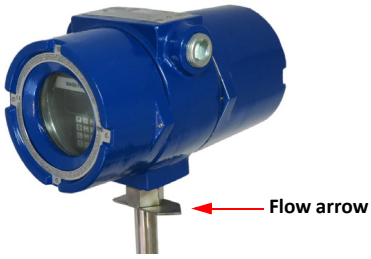


Installation Requirements

The flow meter must be installed and used in accordance with safe design and standard industry practices, accounting for the process pressures, corrosion, temperature, and any potentially hazardous areas.

Important ***The device warranty is void if the device is not installed in accordance with the specified installation requirements. Read and thoroughly understand the installation requirements before attempting to install the device. If you have any questions, contact your Kurz customer service representative before attempting installation.***

Each flow meter has a flow arrow below the sensor electronics head. The arrow indicates the direction of the process flow, as designated in your order specifications.



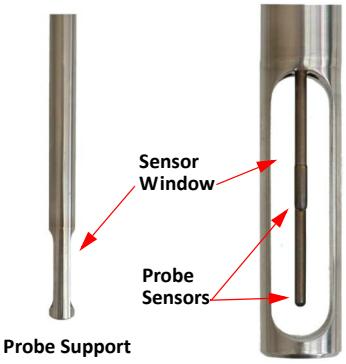
The electronics head on the sensor support must be accessible for wiring. Wiring requirements include electrical and communications (computer) connections.

- For transmitter-attached (TA) devices with the display/keypad option, the area must allow for viewing and accessing the display/keypad.
- For transmitter-separate (TS) devices, the area must provide a location for mounting the transmitter electronics and a connection from the transmitter to the sensor electronics.

Insertion Flow Meters

Insertion flow meters have a sensor support connected to an electronics head. Remove the protective shipping cover from the tip of the probe support before installing the device. The probe sensors must have direct contact with the process flow.

Important ***Do not bend the probe sensors. The probe sensors get extremely hot when the flow meter is powered ON. Do not touch the sensors unless the flow meter is powered OFF and there has been sufficient time for the sensors to cool down.***



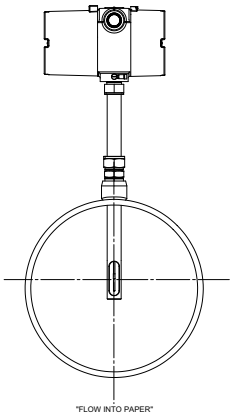
Insertion meters must be mounted to the pipe/duct with a compression fitting, flange mounted, or packing gland and all mountings must be checked to ensure there are no leaks. Considerable force can be exerted on the probe support and flange when the process gas is under pressure.

The insertion depth depends on the duct size and sensor size. The sensor should be center mounted into the pipe or duct so the sensing element is in the middle where there is the most stable flow profile. Due to the recommended placement, a 2.5-inch diameter pipe is the suggested minimum. However, installing a compression fitting, flange, or packing gland offer some flexibility in the sizing recommendation.

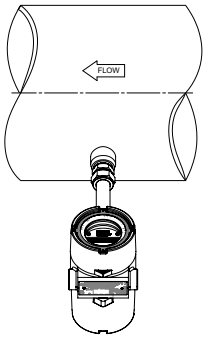
Important ***The probe support must not be altered or modified for any reason.***

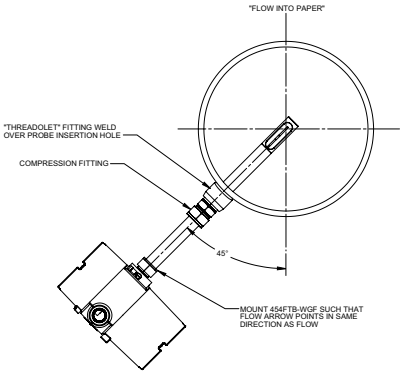
Dry gas and wet gas process flows have different probe angle requirements.

- For the Series 454FTB flow meter with dry gas flows, the probe can be inserted at any angle that meets the general installation requirements.
- For the Series 454FTB-WGF flow meter, the ideal location is at a 45-degrees up angle so that condensed water flows away from the sensor.



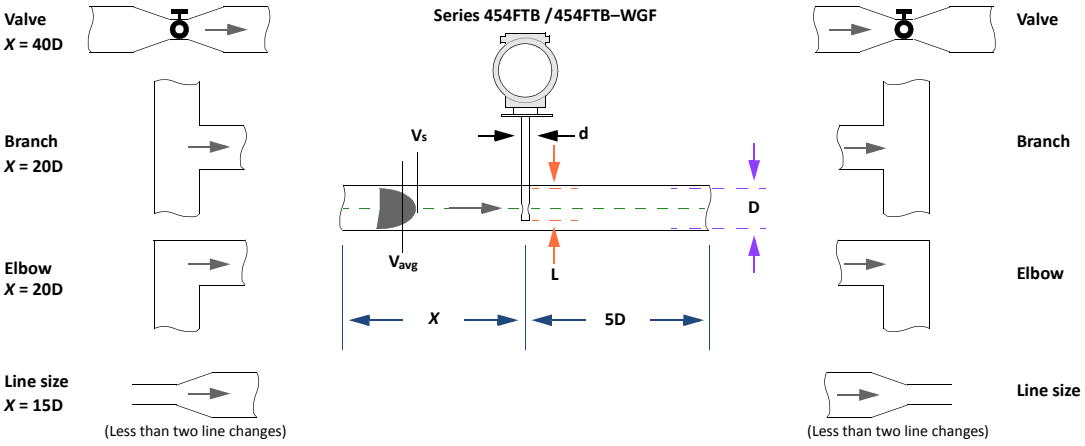
Series 454FTB





Series 454FTB–WGF

Additionally, the flow meter should be installed away from flow disruptions (such as elbows or branches) to ensure the flow meter provides the best repeatability and accuracy.



$A = \pi R^2$ +	$SBCF = A / (A + 12dL)$ +	$V_{avg} / V_s = CF(v)$
where: A = area in ft^2 or m^2 R = inside radius	*where:* L = probe depth in feet or meters d = probe diameter in feet or meters	*where:* V_{avg} = average flow velocity V_s = sensor velocity CF(v) = velocity correction factor

Insertion Flow Meter Guidelines

Before installing and operating an insertion flow meter, confirm the following information:

Mount the probe support so the probe sensors are centered in the duct/pipe. This location has the most stable flow reading. Note the flow arrow points in the direction of the process flow.

Confirm flow arrow:
Yes ___ No___

The upstream-downstream distance from flow profile disruptions are 5*x* diameters downstream and *x* diameters upstream. This provides a 2% maximum error from the baseline straight pipe calibration for the distance criteria. Longer straight runs reduce this error level.

Disruption distance:
Down _____
Up _____

Disruption Types:

Valves change the flow profile as they open and close.

Branching joints change the flow profile as the percentage of flow between the branches.

Elbows or direction changes disrupt long-run pipe profiles by creating a flow profile that wobbles or moves depending on the flow rate. The distance from elbows can be reduced by using field calibrations.

Multiple elbows impart a swirl that requires increasing the upstream distance, typically up to 50% more distance.

A line size change can introduce instability. The distance from a line size change can be reduced by using field calibrations.

The duct or pipe inside dimensions are used to determine the flow area of the meter. An area wizard in the meter setup menu walks you through entering the data and the meter will calculate the flow area.

Dimension:
Pipe _____
Duct _____

The Sensor Blockage Correction Factor (SBCF) is a result of the probe support blocking some of the flow area and accelerating the velocity in the duct/pipe cross section. By measuring from the end of the sensor window to the duct inside wall and entering the insertion depth (L) in the Meter Setup menu, the flow meter will calculate the SBCF.

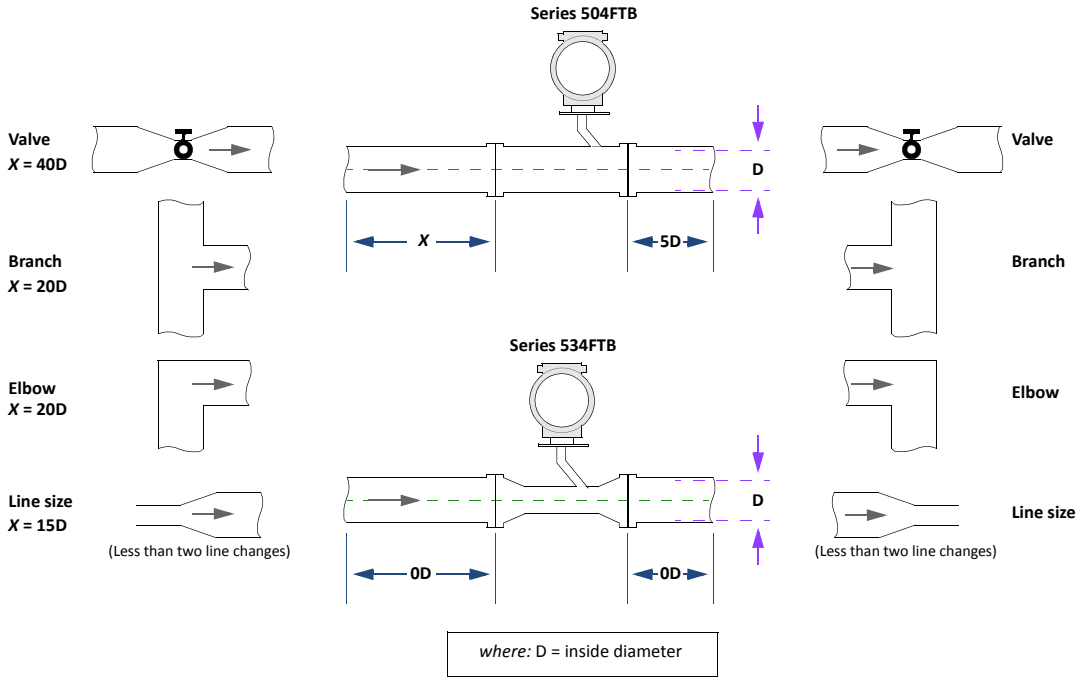
Depth:_____
To wall: _____
SBCF: _____

Insertion flow meters provide good repeatability, but the absolute flow number requires a reference flow measurement (field calibration data). The velocity-dependent (CFv) correction factor is the ratio of True Reading to Indicated Reading. Using a point velocity sensor, convert the volumetric flow rate or mass flow rate based on the area and the average velocity.

Contact Kurz or a field calibration company.

In-Line Flow Meters

In-line flow meters provide excellent accuracy and dependability for small line sizes.



In-Line Flow Meter Guidelines

Before installing and operating an in-line flow meter, confirm the following information:

Note the flow arrow points in the direction of the process flow.

Confirm flow arrow:
Yes ___ No___

The upstream-downstream distance from flow profile disruptions are 5*x* diameters downstream and *x* diameters upstream. This provides a 2% maximum error from the baseline straight pipe calibration for the distance criteria. Longer straight runs reduce this error level.

Disruption distance:
Down _____
Up _____

Disruption Types:

Valves change the flow profile as they open and close.

Branching joints change the flow profile as the percentage of flow between the branches.

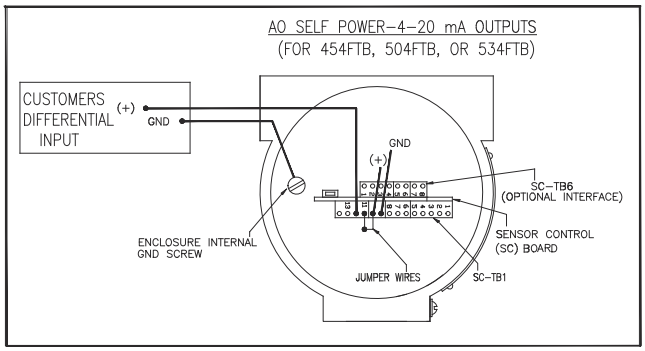
Elbows or direction changes disrupt long-run pipe profiles by creating a flow profile that wobbles or moves depending on the flow rate. The distance from elbows can be reduced by using field calibrations.

Multiple elbows impart a swirl that requires increasing the upstream distance, typically up to 50% more distance.

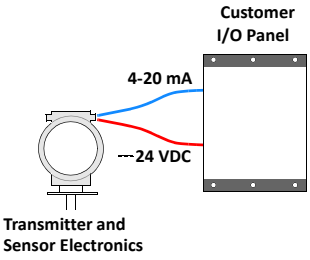
A line size change can introduce instability. The distance from a line size change can be reduced by using field calibrations.

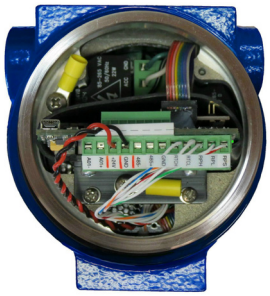
Wiring Requirements

Kurz insertion and in-line thermal flow meters are 4-wire devices, with two wires for power and two wires for signal. There can be four wires for signal if the feature was ordered. The 4-20 mA analog output (AO) connections are for reading flow, temperature, or velocity. The power input is either 24VDC or 85-265VAC. Refer to the *B-Series Hardware Guide* for a complete set of wiring diagrams.

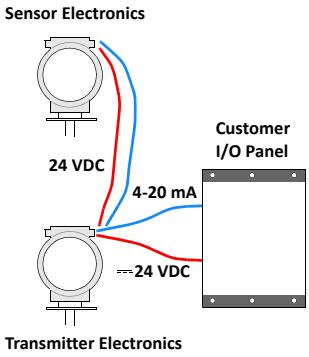


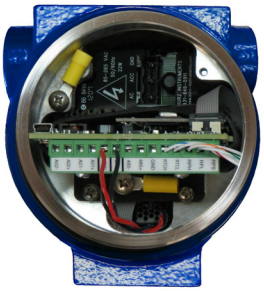
Transmitter Attached (TA) Wiring





Transmitter Separate (TS) Wiring





K-BAR Flow Meter System

The K-BAR is a multipoint sensor array used to measure the flow in applications that:

- Have changing flow profiles at the same flow rate (such as near valves, dampers, or branching duct work)
- Need higher system reliability due to redundant sensors
- Need lower flow noise from averaging a duct cross section

Multipoint Flow System Guidelines

Before installing and operating a multipoint flow system, confirm the following information:

How stable are the gas properties?	Not Stable 1 2 3 4 5 6 7 8 9 10 Very Stable
Is more than one gas state being supported?	Gas 1 _____ Gas 2 _____ Gas 3 _____
What are the expected average velocities?	Average _____
What is the minimum velocity?	Minimum _____
What is the maximum velocity?	Maximum _____
What are the accuracy expectations?	Low Accuracy 1 2 3 4 5 6 7 8 9 10 High Accuracy
Is there a plan for field calibration?	Yes _____ No_____
What are the process temperatures?	_____
How much dirt is present in the flow stream?	_____
What kind of vibrations levels are present in the duct?	Hz _____
What kind of vibrations levels are present near the electronics location?	Hz _____
What kind of vibrations levels are present near the flow computer location?	Hz _____
What is the inner dimension of the duct?	ID _____
What is the outer dimension of the duct?	OD _____
Is there clearance next to the mounting location for inserting the K-BAR, including its J box or attached electronics?	Yes _____ No_____
What kind of wall reinforcement will be needed?	_____

K-BAR Configuration

The system is composed of two components.

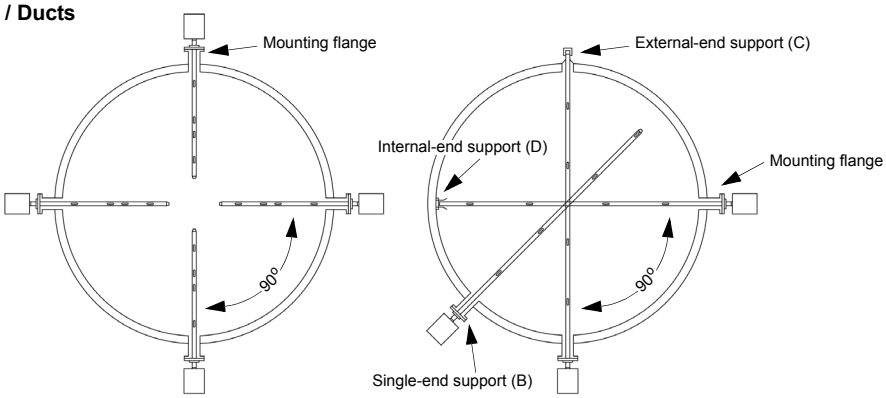
- The sensor array
- The flow computer, which collects and processes the array data in to flow and temperature outputs

Each K-BAR array is custom-sized to measure the process velocity in equal area zones. The average total duct flow is computed based on the duct area using and field calibration factors specified at startup.

The length of the K-BAR probe support determines the mounting requirements. The probe support must be held in place with sufficient rigidity to minimize the vibrations created by the process, and there must be enough clearance for installation and maintenance.

As shown in the diagram, a single-end support installation (categories A, B, E, and F) is cantilever mounted from the flange. The size and length of the flange mounting adapter is determined by the K-BAR specifications. For high vibration applications or when access is limited to one side, a double-end mounting installation (categories C, D, G, and H) is recommended. The double-end support uses a probe support cup on the side opposite the mounting flange.

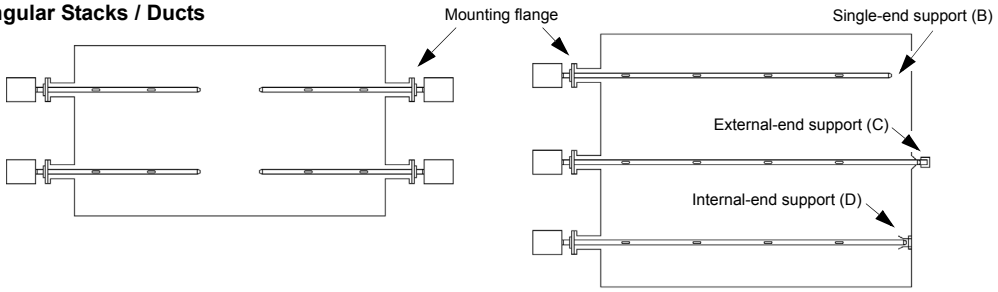
Round Stacks / Ducts



Category A: Half span, single-end support

Category B: Full span, single-end support
Category C: Full span, external-end support
Category D: Full span, internal-end support

Rectangular Stacks / Ducts



Category E: Half span, single-end support

Category F: Full span, single-end support
Category G: Full span, external-end support
Category H: Full span, internal-end support

Most K-BAR installations are flange mounted. In environments where the stack/duct pressure does not match ambient, the clearance gap between the K-BAR probe and flange mounting adaptor can cause significant blow-by. The K-BAR should be installed during a planned outage to reduce safety risks and improve the ease of the installation.

The electronics and wiring locations are determined by several factors such as the application environment, weather, temperatures, vibration, and maintenance requirements. The two most common installation types are:

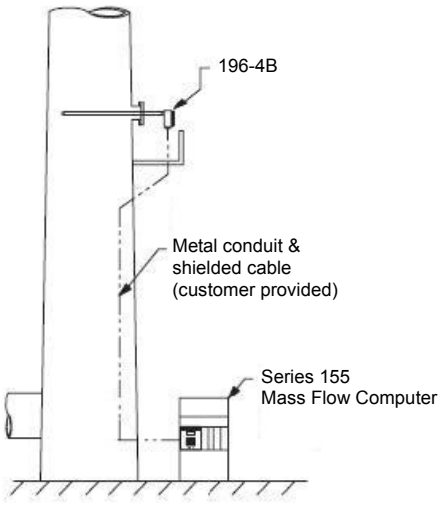
- Transmitter attached

  Transmitter-attached installations send a linearized 4-20 mA flow signal to the flow computer. Each sensor has its electronics on the end of the K-BAR, which minimizes wiring and EMC requirements.

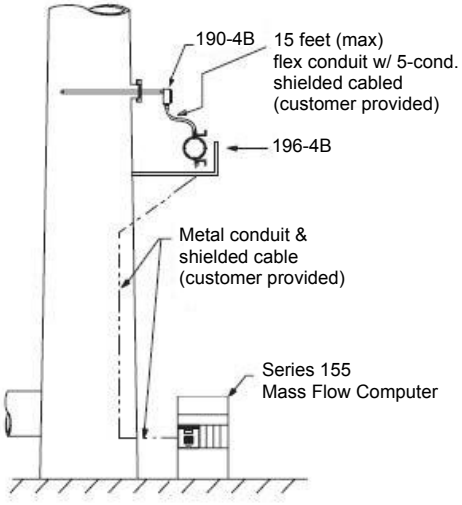
- Transmitter separate

  Transmitter-separate installations typically use a short service loop between the transmitter electronics and the sensor wire junction box on the end of the probe. The wire gage and conduit shielding determine the length you can run the sensor wires. The wire from the K-BAR to the transmitter electronics must be shielded in solid conduit, EMT, or braided shielded cable using peripheral bonds at each end.

Refer to the *B-Series Hardware Guide* for a complete set of wiring diagrams.



Transmitter Attached



Transmitter Separate