

# Digital Coriolis Mass Flowmeters

## CFT51 Installation Guidelines and Quick Start

CFT51  
TRANSMITTER

CFS10 OR CFS20  
MASS FLOWTUBE\*



\* For CFS25, refer to MI 019-125.

### FLOWMETER FEATURES AT A GLANCE

- User-selectable HART or Modbus communication via LCD Indicator pushbuttons
- Precise mass, density, and temperature measurement
- User-configurable, externally powered I/O types isolated from each other
- Accurate 2-phase flow measurement with no interruption or stalls
- Quadrature pulse output for custody transfer applications
- On-line flowtube verification
- On-line pressure compensation
- FM, CE, NEMA 4X and flameproof; 3A authorization
- Meets International EMC standards
- Suitable for applications including:
  - Tanker unloading
  - Centrifuge bottoms
  - Ethylene oxide
  - Sanitary batching
  - Pharmaceuticals batching
  - Food, dairy, beverage
  - Small volume proving

# Foxboro®

by Schneider Electric

## INSTRUCTIONS

This instruction guide does not replace the instruction books that are shipped with the transmitter and flowtube. Please refer to the detailed manuals for electrical safety specifications, standard specifications, installation and wiring details, troubleshooting guidelines, and maintenance instructions.

## PRE-INSTALLATION CONFERENCE

You probably have had an in-depth sizing and selection analysis and discussion with a sales application specialist or applications engineer. If not, and would like one, call 1-866-746-6477 or 1-508-549-2424.

## FLOWTUBE MOUNTING

Do not lift or support your flowtube by its junction box.

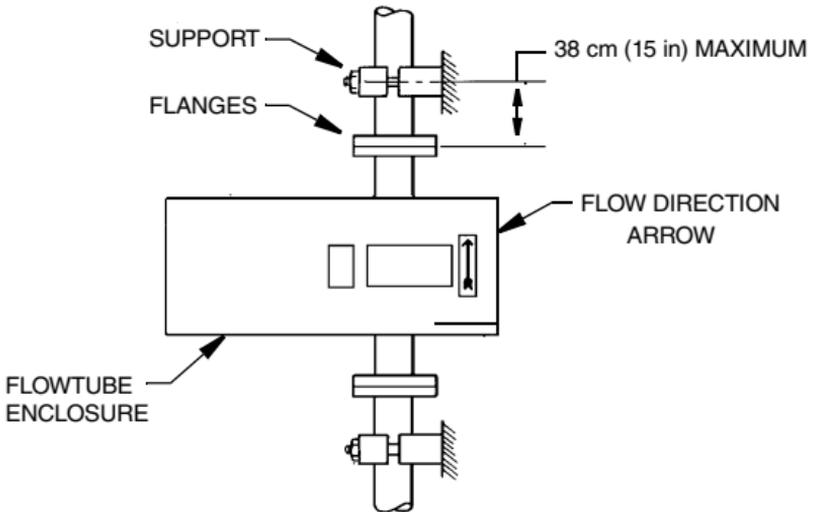
Your flowtube and cable should be mounted no closer than 3 m (10 ft) from any motor, speed controller, large transformer, or power contactor. Vertical mounting is recommended, especially when self-draining is required or gas bubbles are present. Horizontal mounting is acceptable for single-phase applications. When mounted vertically, the direction of flow must be upward to minimize the potential of trapped air.

To isolate the flowtube from external vibration, the flowtube case should not contact piping or any other supports. Also, do not fasten anything rigid to your flowtube including rigid insulation or rigid heat-tracing.

**Figure 1. Flanged End Connections**

**NOTE:**

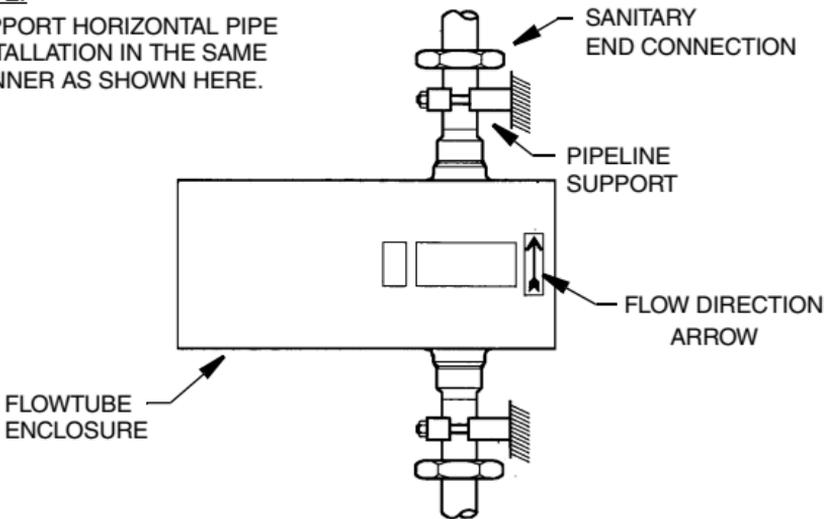
SUPPORT HORIZONTAL PIPE  
INSTALLATION IN THE SAME  
MANNER AS SHOWN HERE.



**Figure 2. Threaded or Sanitary End Connections**

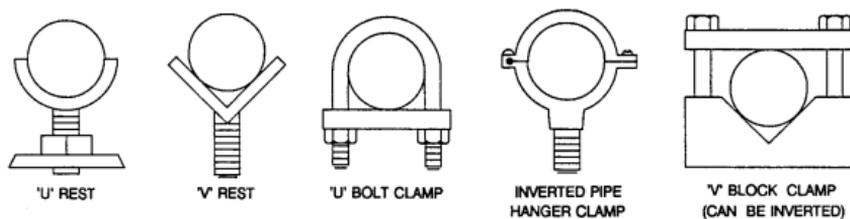
**NOTE:**

SUPPORT HORIZONTAL PIPE  
INSTALLATION IN THE SAME  
MANNER AS SHOWN HERE.



1. Determine the face-to-face dimension between your flowtube end connections. For CFS10 and CFS20, see MI 019-120. For CFS25, see MI 019-125.
2. Fabricate the end connections to the pipe.
3. Provide upstream and downstream pipeline supports. Supports can extend from the floor, ceiling, or wall. The type of support is dictated by process connection type and flowtube size.

Figure 3. Recommended Pipeline Supports



All pipeline supports must provide a minimum of 25 mm (1 in) of axial length of surface.

4. Move your flowtube into position with the arrow on the flowtube pointing in the direction of flow. Align the flowtube and secure it to the pipeline properly.

**A flowtube should never be used to support or align the piping.** When a spool piece, that was fabricated and placed where the flowtube is intended to be used, is removed, the upstream and downstream piping should not move.

## TRANSMITTER MOUNTING

Your CFT51 transmitter has four 0.437-20 UNS threaded holes on the surface of the enclosure on which a carbon steel mounting bracket or an optional stainless steel mounting bracket can be attached. The other surface of the bracket allows for mounting to a surface or to a nominal DN50 (2 in) or DN80 (3 in) vertical or horizontal pipe. You can position the housing at almost any angle in a horizontal plane by loosening the bracket bolt and turning the housing with respect to the mounting bracket.

## WIRING

### SIGNAL CABLE PREPARATION

The cable from the flowtube is dressed at the transmitter end and ready for connection to the transmitter.

If conduit is used, run the unprepared end of the cable through the conduit from the transmitter.

1. Cut the flowtube end of the cable to length and strip back the jacket approximately 127 mm (5 in).

The maximum distance between the flowtube and the transmitter is 300 m (1000 ft).

2. Separate the twisted pair conductors from their wrappers, shields, and drain wires. The wires should remain twisted for ease of identification.
3. Trim the shields, wrappers, and drain wires back to the jacket interface. The shield is not connected at the flowtube end.
4. Strip the ends of the conductors 6 mm (1/4 in).

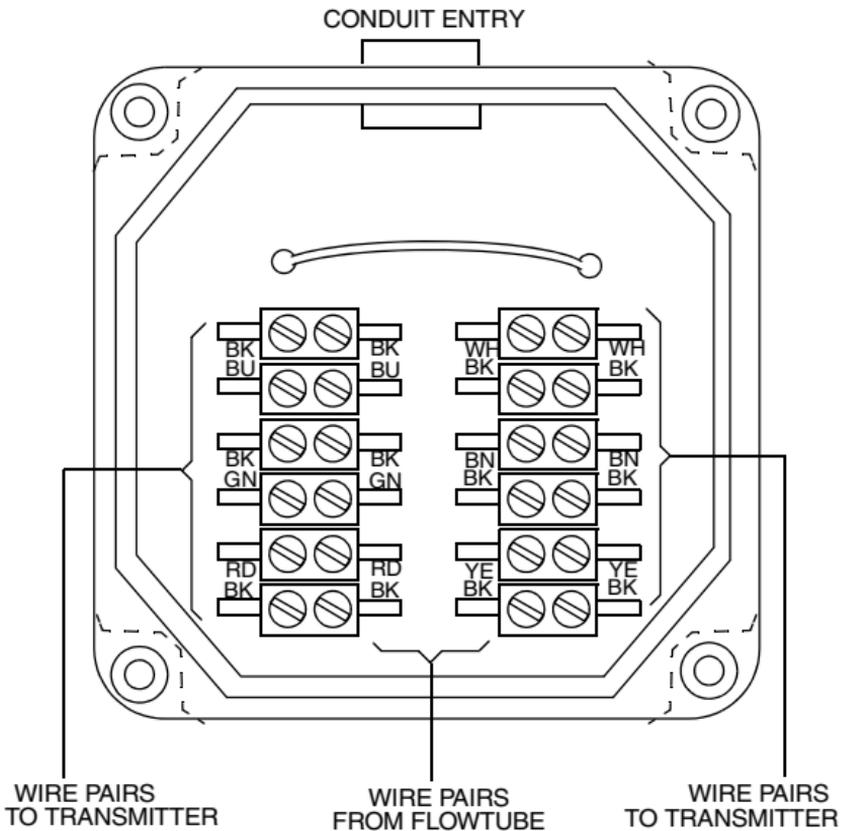
## WIRING TO THE FLOWTUBE

1. Remove the junction box cover and insert the cable end through either a cable grip or a conduit connector.
2. Route the wire pairs to the proper terminal block.

To identify the wires, ensure that the proper wire pairs remain twisted as the black wires are not common.

3. Insert the ends of the individual wires into the appropriate terminal block openings carefully matching the wire color pairs of the cable to the wire color pairs of the flowtube.

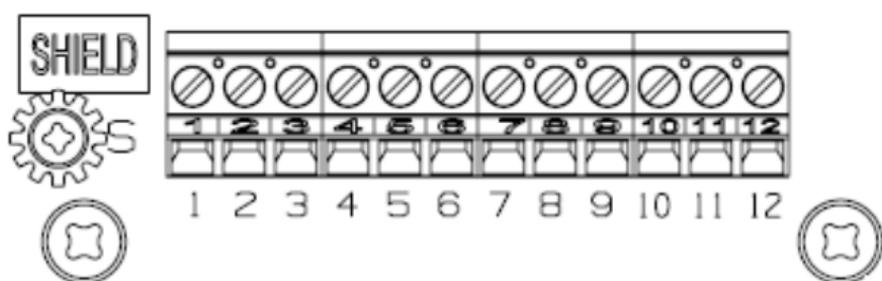
*Figure 4. Flowtube Junction Box Wire Color Orientation*



4. Tighten the screws. No bare wire should be visible. Secure any excess wiring and re-install the cover to the junction box.

## WIRING TO THE TRANSMITTER

Connect the wiring from the flowtube to the transmitter junction box as follows:



Terminal	Wire Color	Signal
1	Black	RTD
2	Blue	
3	Black	
4	Green	RTD
5	Red	
6	Black	Sensor B
7	Black	
8	Yellow	Sensor A
9	Black	
10	Brown	Driver 2
11	Black	
12	White	Driver 1
Attach cable shield to the "Shield" Terminal.		

At this point, your flowtube and transmitter should be mounted properly and your cable ends prepared and terminated at both the flowtube and transmitter ends.

## FIELD WIRING

To access the transmitter field terminals, remove the field terminal compartment cover by turning it counter-clockwise. The field terminal compartment cover is the one closest to the conduit openings.

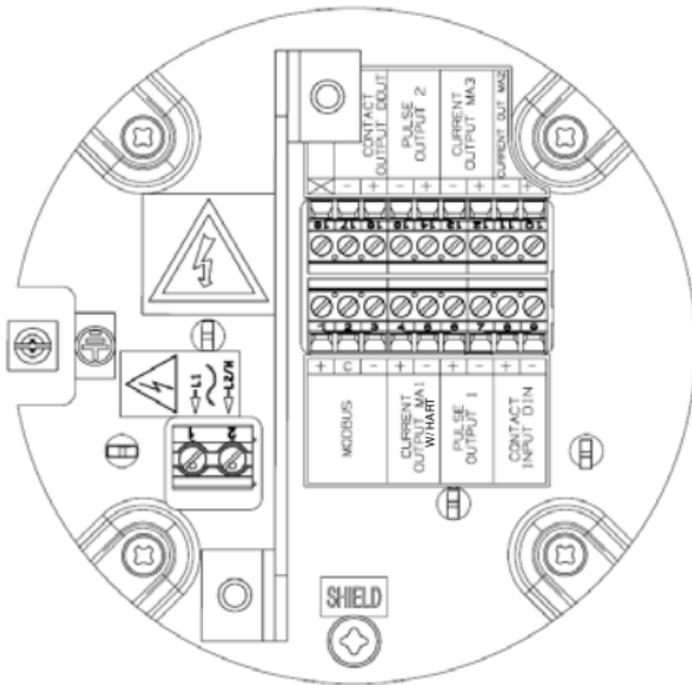
Wire entrance is 1/2 NPT or M20. Left entrance is for power and the right one is for inputs and outputs.

## Power Wiring

Look at the transmitter data plate to determine if you have an ac or dc powered transmitter.

- If ac, connect line power to Terminal 1, neutral power to Terminal 2, and the ground wire to the separate ground terminal. Voltage range is 108-132 V ac or 216-264 V ac.
- If dc, connect the + side of the power supply to Terminal 1 and the – side to Terminal 2. Ground the negative side (optional). Supply limits are 10-36 V dc.

*Figure 5. Field Wiring Terminal Board*



## Input/Output Wiring

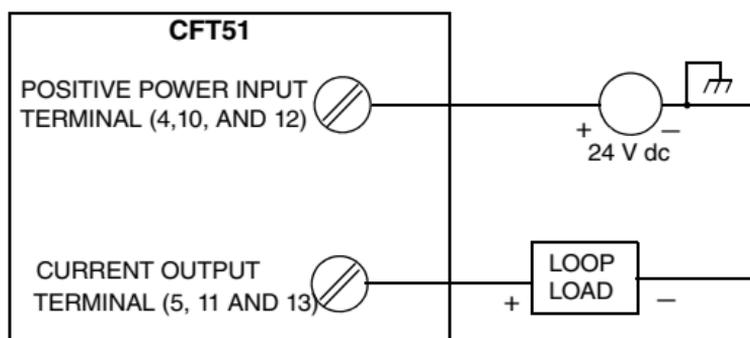
The CFT51 supports multiple I/O options (isolated and non-isolated) which require external power source. However, if only one power source is available, the + terminals of the I/Os can be connected together. In this case, the I/Os are no longer isolated from each other. See 'Input/Output Wiring table' in MI 019-140.

The CFT51 Transmitter output circuits are externally powered. The most common supply voltage is 24 V dc.

## Input/Output Wiring Diagrams

There are 3 current outputs available. Current output 1 includes digital HART communications interface. Current output 2 and 3 are used for 4-20 mA only. Figure 6 shows the wiring diagram:

Figure 6. Current Output Wiring Diagram



For Current Output, Contact Input, Contact Output, Pulse Output, and Multidrop Network diagrams refer to the "Input/Output Wiring" section in MI 019-140.

## WIRING VERIFICATION

Go to Status mode and check the following:

- Tube mode is normal
- Tube Frequency is between 65 and 85 Hz
- Sensor Amplitude is approximately 0.3 Vp/p
- Drive Current is between 0.010 and 0.015 A

## CONFIGURATION AND ZEROING

### CONFIGURATION

At this point, your flowtube and transmitter have been mounted and wired properly. Your transmitter comes pre-configured for either HART or MODBUS communications depending on what you ordered. You can switch between the two in the setup menu. With any of these options, two configuration menus exist, Quick Start and Setup. Most basic applications can be configured in Quick Start mode; other applications can be configured in Setup mode.

### Quick Start

Quick Start mode can be used for applications requiring only:

- Flow measurement in current units (factory default is mass flow in lb/min)
- Current output
- Positive flow direction

The Quick Start menu is located on page 10 of this brochure.

Note that the Quick Start also includes Zeroing which is described in “Zeroing” on page 11.

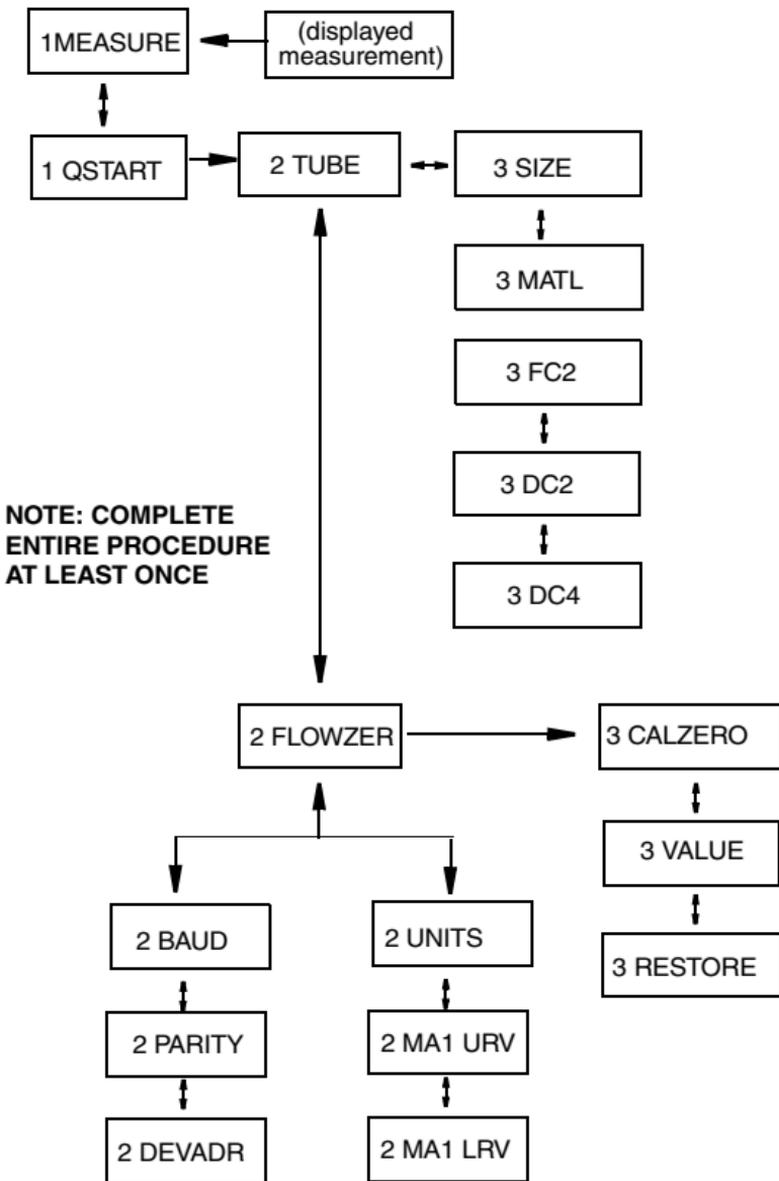
### Setup

Use Setup for applications requiring:

- Volume flow or density measurements
- Mass flow units other than the current units
- Pulse or Contact Output
- Alarm or Totalizer functions
- Reverse or bidirectional flow

The Setup menu is described in MI 019-140.

Figure 7. Quick Start Menu



Flow and density constants are found on the calibration sheet shipped with your flowtube. They are also on your flowtube data plate.

Flowtube size and material are part of the model code.

For example: CFS10-02 S



## ZEROING

After you have properly installed both components of your flowmeter and configured your transmitter, a brief but essential Zeroing must be performed before you begin actual operations.

Even when there is no flow through the flowtube, the transmitter may register small, fluctuating amounts of phase shift between the sensor pickoffs. The source of this nonzero signal may be mechanical noise or signal processing electronics, or most likely, a combination of these. Zero Calibration compensates for this effect.

Zero Calibration is required at initial startup only and does not need to be repeated unless you replace the flowtube or transmitter.

The steps required to perform Zeroing are:

1. Check that all safety covers are secured.
2. Run process fluid through the flowtube for at least five minutes. This is to remove all the air from the flowtube and also to develop temperature and pressure that are normal to the process.
3. Close block valves completely to halt process flow through the flowtube but leaving the flowtube filled with process fluid.
4. Using the Quick Start menu or Calibration menu in Setup option, go to CALZERO.
5. Press the Enter key to start the Zeroing process. The display reads 'BUSY' until the calibration is finished and then it reads 'DONE'. If the calibration fails, repeat the procedure. If a second failure occurs, contact Global Customer Support for guidance.

You have now successfully installed, configured and calibrated your flowmeter. Your CFT51 Digital Coriolis Mass Flowmeter is ready for process control operation.

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